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In the Washington notes of the *Journal of Political Economy* for November it is said of the cases before the Interstate Commerce Commission involving the reasonableness of recent advances in freight rates to the Southeast and Southwest: "The cases differ from any hitherto presented to the Interstate Commerce Commission under the Hepburn act in that they affect whole sections of the country and large groups of commodities. It is thus impossible to pass upon the legitimacy of the advances in rates by mere comparison with other rates as has been the general practice of the commission in the past. The cases are so stated as practically to compel the acceptance of some relationship between valuation and rates on the part of the Interstate Commerce Commission, or the development of some other definite criterion for judging of the justice of railway charges." This statement overlooks the fact that the commission can, and in some very important cases has, passed upon the legitimacy of advances in rates by mere comparison with the rates previously in effect. In the northwestern lumber rate cases, for example, which affected a very extensive part of the country, the commission had an excellent chance to pass upon the reasonableness *per se* of the advanced rates that the roads had made, but it did not take advantage of the opportunity. There was strong evidence to show that the rates on lumber previously in effect had become too low as compared with rates upon other traffic. But the commission held, substantially, that as the rates superseded had been long in effect and the railroads had prospered under them, it must follow that they were reasonable and that the higher rates substituted for them were excessive. This kind of reasoning would tend to justify rates that had always been unprofitable if they had been in effect a long time and the road had prospered in spite of them through the higher rates charged other shippers or communities or on other commodities. It is to be hoped that the commission will develop a sounder line of reasoning in passing on the "southwestern" and "southeastern" rate cases.

The practice of giving away souvenirs at the annual convention of the American Railway Master Mechanics' and Master Car Builders' Associations is to be stopped at the instance of these associations. This is commendable. In principle, the act was unwise, and the practice of it had become a first-class nuisance. Starting in a small way when the associations were young, the custom grew in proportion to the attendance. From being a simple matter, the work of getting gifts of any value into the hands of those for whom they were bought became a task of no small moment, and frequently resulted in lasting jealousy and discontent. In the matter of inexpensive souvenirs, nearly always given freely, the same arguments do not apply, yet the actual nuisance centered around these minor gifts. It is unwise, in some ways, to bar the general public from the exhibits; but the practice of giving away something for nothing attracted to the booths of the exhibitors many undesirables who had no other interests there. Often it was impossible for railroad men to examine devices brought there for their benefit, because every available foot of space around the exhibits was occupied by women and children clamoring for "souvenirs." The abolition of the custom will soon become known and do much to reduce the presence of these people. The relief will be welcomed by the supply men.

CORRECTING DISCRIMINATIONS BY REDUCING RATES.

Judging by experience, the ink will hardly be dry on the tariffs the railroads are printing making advances in freight rates when reductions will begin that soon will largely or wholly offset the raises. When concerted advances have been made in the past some of the roads always speedily have found, or imagined they have found, that the new adjustment of certain rates was disadvantageous to them. Others have thought that the new adjustment of certain other rates was inimical to them. The roads that have thought that they were hurt have made reductions which their competitors have met, and gradually the advantage of the advance has been frittered away. Shippers can point to numerous specific advances within the past ten years; but, owing largely to innumerable reductions by the carriers meantime, the average rate per ton per mile is lower now than it was ten years ago.

Public authorities also are constantly making reductions that tend to nullify the efforts of the roads to get rates on a higher basis. We do not refer so much to legislation and orders of commissions making wholesale reductions as to the many orders by the commissions, state and interstate, to stop alleged discriminations. Wholesale reductions are often set aside by the courts. Reductions of specific rates alleged to be unfair are usually not contested by the roads, and when contested are often upheld because of the difficulty of proving that the lowering of any one rate or schedule of rates will cause loss to the carrier. All students of railroad matters concede that the average freight rate in the United States

is very low. But when a shipper alleges unfair discrimination he never complains that the rate made to his competitor is too low. He always complains that the rate he is charged is too high. Likewise, when legislators and commissions seek to correct alleged discriminations it never seems to occur to them that the wrong may best be righted by the raising of the lower rates rather than by the reduction of the higher. And legislatures and commissions (and shippers when it is to their advantage) tend more and more to assume that distance is the main or sole criterion of whether one rate is reasonable, as compared with another. Some of the western and southern states have provided by law that any rate in those states that is higher than a rate for the transportation of the same commodity for an equal distance in an adjoining state shall be treated as *prima facie* unreasonable.

The Missouri River Jobbers' case, which has been appealed from the Commission to the courts, illustrates the exaggerated weight that shippers give to distance when this suits their purpose. There is almost no competition between the jobbers at Missouri river cities and those at the Twin Cities, and the rates to the Twin Cities are controlled by lake competition. Yet the jobbers at Kansas City, St. Joseph and Omaha complained about their class rates from New York solely upon the ground that they were higher in proportion to mileage than those to St. Paul and Minneapolis; and the Interstate Commerce Commission gave them a large part of the reduction for which they asked.

Like most shippers, the jobbers of Kansas City are seeking their own advantage, regardless of logic or of fairness, to the railroads, and if the railroads should seek to put the jobbers at Wichita and Salina, Kan., on a mileage parity with those at Kansas City we can imagine the latter taking as inconsistent an attitude as those at Chicago have taken. The jobbers at Chicago are again trying to get the Interstate Commerce Commission to reduce their class rates to the southeast. Their main argument is that on the basis of mileage they are entitled to lower rates to the southeast, as compared with the rates from points on the Atlantic seaboard. Yet two years ago the jobbers at Chicago tried to convince the Western Trunk Line Committee that "no substantial reason existed" why class rates should continue to be higher from Chicago than from St. Louis to trans-Missouri territory, despite the greater mileage from Chicago.

The most inflexible distance tariff in the country, perhaps, is that in Iowa. The shippers in that state think highly of this tariff, in so far as it tends to protect them against the competition of shippers in other states. The packers at Ottumwa, whom the distance tariff tends to protect against the big packers at Chicago and Omaha, are exceedingly well satisfied with it. But while the packers are satisfied the jobbers at Ottumwa have complained to the Interstate Commerce Commission because the railroads apply the state distance tariff on interstate shipments passing through Burlington to Ottumwa. This, they allege, gives the jobber at Burlington an unfair advantage over the jobber at Ottumwa, and they ask that the roads be compelled to make through rates to Ottumwa lower than the combination on Burlington.

These instances illustrate the attitude of shippers all over the country. Where the argument of distance is available it is used as if the surveyor's transit were the only proper instrument to be used in rate-making. Where the argument of distance is against a complainant it is contended that competing shippers and markets should be put on a parity, regardless of distance. But always the demand is for lower rates. The law, by empowering commissions to fix maximum, but not minimum rates, assumes that discriminations should always be rectified by reductions. The Interstate Commerce Commission seems to assume that the tendency of rates ought always to be downward when it asks Congress for power to restrain advances without asking for power to restrain reductions, although it is quite obvious that discriminations and disturbances to business may result from putting a rate down as well as from putting a related rate up. The roads themselves find it very hard to correct discriminations by raising rates that are too low, because it is difficult, and illegal under the Sherman law, for competing carriers to make binding agreements to raise rates and maintain them on a reasonable basis, and because shippers that benefit by unfairly low rates always fight advances, and commissions habitually put on the carriers the burden of proving, not that the rate advanced was so low as to be discriminating, but that it was positively unremunerative. The action of shippers and the Interstate Commerce Commission in the Northwestern lumber rate matter is a good illustration of what happens when railroads try to raise rates that have become unfairly low, as compared with rates on other traffic. Shippers complained against the advance, and the Commission sustained them.

There is not a shipper, or a market, or a kind of traffic, that has not some advantages and some disadvantages in rates. If every disadvantage that a shipper or locality or kind of traffic has, as compared with other shippers or localities or kinds of traffic, is to be removed by reducing the rate that is relatively higher, and in no case are such disadvantages to be removed by raising the rate that is relatively lower, the carriers plainly will have a very hard time getting or keeping their rates on a higher basis, or even keeping them from being reduced to a lower basis.

If it be conceded that the average freight rate in the United States is not unfairly high, and that therefore the main object of public regulation should be to correct unfair discriminations, it would seem logically to follow that reductions of rates should not be used alone to attain this object. The law should permit and encourage the carriers to make binding agreements to raise rates that are inequitable because too low. Whether railroad commissions should not also be specifically authorized and required to correct unfair discriminations by reducing rates, or by raising them, or by raising some rates and reducing others, according to the circumstances of each case, is a question that merits serious consideration. The law ought in some way to impose upon those that it empowers to regulate railroads the duty also of doing them justice and protecting them.

THE HARDNESS AND WEAR OF STEEL RAILS.

The experience with open hearth rails having as low as .04 phosphorus and low carbon shows that while the rails are very tough and easily meet the drop test they do not wear well, especially on curves, and their life is short. In making specification for open hearth rails, it is important therefore that the carbon content be more than that ordinarily used for high phosphorus Bessemer rails. Some information is at hand showing that the carbon can be increased up to 0.8 or 0.9, and that the rails while hard can be safely used and will have a much longer life. It is desirable therefore that the relation of phosphorus and carbon in rail steels should be such as to insure both toughness and hardness. It is also possible that hardness may be obtained by the use of some cheap alloy that will insure good wearing qualities and at the same time retain the toughness and prevent breakage. The condition of rail manufacture seems to call for a careful study of the relation between hardness and wear in steel rails and for more exact measurements of hardness and wear than have been made.

There has been much progress in methods of testing materials for hardness. Mr. Sanberg, in his study of the hardness of rails, employed the Brinell method, which uses a ball about ¾ of an inch in diameter and a pressure of about 50 tons. While he used the Brinell apparatus, his method of interpreting results was different from that ordinarily employed. Instead of dividing the pressure by the area of the spherical surface of the cavity, he apparently divided the

volume of the depression by the pressure, which resulted in the numbers decreasing with the decrease of hardness. The Hughes and Kryloff apparatus has also been used for testing the hardness of rails. This apparatus is based upon the fundamental principles relating to iron and steel, first, that the magnetic capacity is directly proportional to the softness or molecular freedom, and, second, that the resistance to a feeble external magnetic force is directly as the hardness or molecular rigidity. Experience with this apparatus shows conclusively that if the form and size of a piece of steel remains the same, the magnetic capacity will be found to vary with slight changes in its composition and give a very accurate indication of the degree of hardness. The softer the piece the greater the magnetic capacity. As the hardness varies with the carbon content, the instrument will show the percentage of carbon in any two samples of steel which are alike in form and size. This test has been shown to be accurate within .025 per cent.

A third method of measuring hardness is based on the assumption that hardness is proportional to the energy of recuperation when the limit of elasticity has been exceeded. This instrument is called the scleroscope. It is used as a hammer for striking a blow of such force that the limit of elasticity is exceeded. The hammer used in the harder substance makes an impact calculated to be equivalent to a pressure of 75,000 lbs. to the square inch. The limit of elasticity is thus exceeded and a permanent indentation is made, and the rebound is used to measure the energy of recuperation. In the scleroscope the total fall is about 10 in. It is divided into 140 graduations, and a rebound is measured against such a scale. An upright glass tube guides the falling hammer. It is cylindrical and has its lower end pointed. A method of treating the hammer steel has been found so that it is possible to make a fine pointed hammer capable of withstanding severe shock used in testing hard steels. The table of hardness disclosed by this instrument gives a variation ranging from 2 for lead to 110 for the hardest steel. Wrought iron is 18 on the scale; rail steel containing 0.5 per cent. carbon ranges from 26 to 30. Hardened tool steel of 1 per cent. carbon measures as high as 90. This instrument is now in practical use by some of the steel companies, several of the machine tool builders and the larger electrical manufacturers.

That hard steel will endure extraordinary wear has been shown recently in the experience of the Boston Elevated Railway, where soft, low carbon, 85-lb., Bessemer rails were worn out on an 82-ft. curve in 44 days. Hard, manganese, cast steel rails have been in service on the same curve over six years with a reduction in height of .46 in. and are still in use. The comparative wear of various grades of rail steel on a curve of 100 ft. radius on this road is found to be as follows: Open hearth, low carbon, low phosphorus rail, 82 days; ordinary Bessemer steel, 0.45 carbon, 125 days; nickel steel, 202 days; high carbon (0.78) Bessemer steel, 348 days, and cast manganese steel, 3,864 days. The estimated wear of the last named is based on the six years' wear already obtained. The rolled rails made by the Manganese Steel Rail Co., Passaic, N. J., containing nearly 12 per cent. manganese, are so hard that they cannot be drilled; but they are very tough, meet the most severe drop tests, and strange to say, the deflection is as great as that of the softer Bessemer rails.

The fact that hard rails render a much longer service than those having ordinary degrees of hardness has also been demonstrated by the Pennsylvania Railroad in its experience with 3,000 tons of high carbon, low phosphorus, basic, open hearth rails, a part of which have been tested on the Horse Shoe curve. Each rail is subjected to wear by 10,400 wheels per day, and it is found that their wear has largely exceeded that of the Bessemer rails laid alongside in the same track.

In a special test on this line on a 6-degree curve the Bessemer rails contained 0.48 carbon, and phosphorus 0.08 to 0.1. In the open hearth rails the phosphorus was as low as .009 and .011, and one lot contained .79 carbon, and the other .89 carbon. The Bessemer rails were worn out in about 500 days, while the open hearth rails after 820 days were still fit for further service, those containing lowest carbon having worn the most. It has been shown also that open hearth rails containing 0.80 to 0.90 carbon will wear longer on curves than those containing 0.6 carbon and 3 per cent. nickel.

This relation between hardness and wear in rail steel is also being demonstrated in a more rapid manner by the machines which have been constructed for the purpose of measuring the comparative wear of steels having different chemical composition.

The Pennsylvania Steel Company recently exhibited at Atlantic City a large machine for testing the wearing qualities of rails on sharp curves, and for measuring accurately at the same time the relative value of different grades of steel in resisting wear. A circular track 20 ft. in diameter is composed of three equal lengths of rail, 100-lb. section, connected by standard fastenings, each length of rail being a different grade of steel. Two 33-in. car wheels having independent axles mounted in bearings on a heavy revolving beam are supported by the test rails. A large center pin is used to transmit power to the revolving arm through bevel gearing directly connected to a 50-h.p. electric motor. A compression spring on top of the arm exerts a vertical pressure up to 60,000 lbs. through each car wheel. Lateral pressure of the wheel flange against the rail up to 15,000 lbs. is produced by means of compression springs mounted on the axle of each wheel. The maximum speed is 85 revolutions per minute, corresponding to about 60 miles per hour. By the use of the machine wear equivalent to one week's service on the Pennsylvania Horse Shoe curve can be obtained in one day. The principal use of the machine has been to show the remarkable wear of very hard manganese steel rolled rails made by the Manard process. These rails are so tough that a 100-lb. section 33 ft. long can be given two complete twists so that the rail head is wrapped around the flange. They will stand repeated drop tests until bent into a V shape without fracture, and their great ductility is indicated by a tensile strength of 150,000 lbs. and an elongation of 50 per cent. in 8 in. The tests of the wearing qualities of these very hard and tough rails on the machine above described indicate that a service equal to six times that of ordinary Bessemer rails may be expected.

Another machine for measuring the comparative wearing qualities of rail steel was described in a paper by E. H. Saniter at the September, 1908, meeting of the British Iron and Steel Institute. The principal merit of this machine is its rapid action, the test being completed in an hour or two. The test piece is taken from the top corner of the rail head. It is ½ in. in diameter, 5 in. long and has a bearing $\frac{1}{16}$ in. wide against the inner ring of a ball bearing which it rotates by friction. The piece projects through the bearing a sufficient length to prevent any material side flow of the metal. The ball bearing is loaded with a fixed weight, 205 lbs., and the action is similar to that of a wheel rolling on a rail. The comparative results obtained from this machine with rail steel of varying degrees of hardness are interesting, as corroborating, in tests of a few hours' duration, the superior wearing qualities of hard steel, which requires for its demonstration from one to two years in actual track tests. The machine has definitely shown the rapid wear of open hearth steel containing 0.40 carbon and the more enduring qualities of rails made by the same process but containing 0.75 to 0.85 carbon.

From the information thus far obtained as to the behavior of open hearth steel rails it is probable that there may be some disappointments due to their rapid wear, especially on curves, and where the carbon content is too low, and the next complaint to be made to the rail maker will relate to soft rails and low service. It is also reasonably certain that open

hearth rails containing low phosphorus can be used with safety when they contain as high as 0.9 carbon and that the service obtained from them on sharp curves will be at least double that rendered by much of the low carbon, open hearth steel which has been rolled this year. If these conclusions are correct it would seem that the interest of the railroads should not be confined to the mere price of rails per ton, but they should be more concerned in obtaining such intelligent specifications and inspection for open hearth rails as will secure the largest amount of service from a dollar's worth of steel.

TRACK-TESTING MACHINES.

Maintenance of way officers of railways are thoroughly aroused to the damage which is being done to track by heavily loaded cars and locomotives having excessive driving-wheel loads, coupled with irregularities in the treads of wheels and tires, and by the stresses produced by the lateral thrusts of drivers with locomotives having defective wheel arrangements. All this has led to a growing interest in track-testing machines.

The Pennsylvania Railroad has done a large amount of experimenting with its cast steel tie-testing machine, which is arranged with a plunger having a hardened steel ball in the end bearing against a soft steel strip. With this machine it has been able to measure, with fair accuracy, the lateral thrust due to different arrangements of driving wheels and different types of engines with respect to front trucks, so as to determine if possible the best arrangement of wheels for electric locomotives.

The Pennsylvania Steel Company has built a machine for testing the wear of rails by the revolution of heavily loaded wheels arranged on a beam and running on a circular track composed of three different rails whose wear it is desired to measure. By this machine it is possible to determine what will be the wear of rails of different hardness in about one-seventh the time required to get the same information from rails in regular track.

The damaging effect of flat spots on car wheels has long been recognized, and there has been a strong effort to reduce the limit for condemning wheels, so that the allowable length of spot would be 1¾ in. instead of 2½ in. as heretofore. The condemnation of all wheels having 1¾ in. flat spots would be expensive for the railways, and there is naturally a hesitancy to adopt such a rule unless it is actually necessary. The desire to obtain some more exact knowledge as to the effect of flat spots on the rail has led to the presentation of a mathematical solution of the problem by Prof. Charles H. Benjamin in his paper, "Flat Spots on Car Wheels," which was read at the November meeting of the Western Railway Club. We published an abstract of this paper in our issue of last week, together with an illustration of a testing machine which Professor Benjamin has proposed as a means of obtaining more exact information on this subject than can be derived from a mathematical treatment.

The laboratory method of testing railway materials and appliances has resulted in a great improvement in our knowledge of the forces acting in railway machinery and the resistance of the structures. Tests which involve impact, however, are usually unsatisfactory on account of the difficulty in interpreting the results, as the effect of the blow depends so much on the character of the anvil and its support. For this reason we feel some doubt whether any exact measurement of the effect of flat spots on a rail in regular service could be made by the machine proposed. After showing that there are some conditions which mathematical analysis do not allow for, Professor Benjamin says "it is extremely desirable from both the scientific and the business point of view to determine experimentally the exact effect of the blow delivered by a flat wheel on the rail." While it may be possible to measure the energy of impact with the machine proposed, we do not see that it is possible to measure the exact effect of the blow, which is quite a different thing. As we understand it, the machine would make indentations in a soft metal, due to the impact from the flat spot in the wheel and the amount of energy due to these indentations could be measured by producing a similar indentation under a drop press. This would simply be an artificial determination of the effect of the blow when delivered upon a heavy anvil. It is not clear that the figures could be usefully employed unless some means are provided for determining the relation between the effect of this amount of energy acting on a heavy anvil and the same amount of energy acting upon the rail when supported by a tie and yielding ballast. On account of the less rigid nature of the track and the greater motion under the blow, the effect of equal amounts of energy under the two conditions would be far different. We conclude, therefore, that in order to make any approximate measurement of the effect of a flat spot on a revolving wheel upon the rail, it would be necessary to have the blow delivered upon the rail resting in its natural position on track and ballast.

It is surprising to find in the paper referred to that the ordinary drop test required by rail specifications should be used as a reference in obtaining a factor of safety in the test of impact due to flat spots on the wheel. In the drop test for rails the specimen is bent and takes a permanent set; the limit of elasticity is exceeded and the stress may be near the ultimate strength, but there is no definite measurement of strength in this test. In the impact test of flat spots the limit of elasticity is not exceeded, and there is no similarity in the two conditions of test, so that it is not clear why the rail drop test is suggested as a means of obtaining a factor of safety or as a measurement in any way of obtaining the resistance of the rail to the impact of the flat spots on wheels.

SOUTHERN RAILWAY.

"The problem upon which stress was laid in the last annual report of providing facilities for handling economically and promptly an increasing business, the volume of which had already overtaxed, and nearly overwhelmed, the operations of the company, continued to be the apparent and palpable problem of management for only a month after June 30, 1907. The financial panic of October, 1907, had its effect in an immediate business depression which was startling in its sudden contract to the conditions which had crowded upon all American industries for several years. It was felt as keenly in the industrial South as in any part of the United States. The operating revenues of the Southern Railway had steadily increased for ten years until they had their culmination in earnings of $5,547,203 for the month of October, 1907. But with November the recession began. The average daily earnings for the fourth week in October had been $199,393, while for the four weeks in November they were $184,522, $176,263, $172,704 and $161,140 respectively. A similar steady decrease continued during December and into January until the first low level of what may be considered the panic condition was reached, with average daily earnings of $131,487 for the second week in January, 1908.

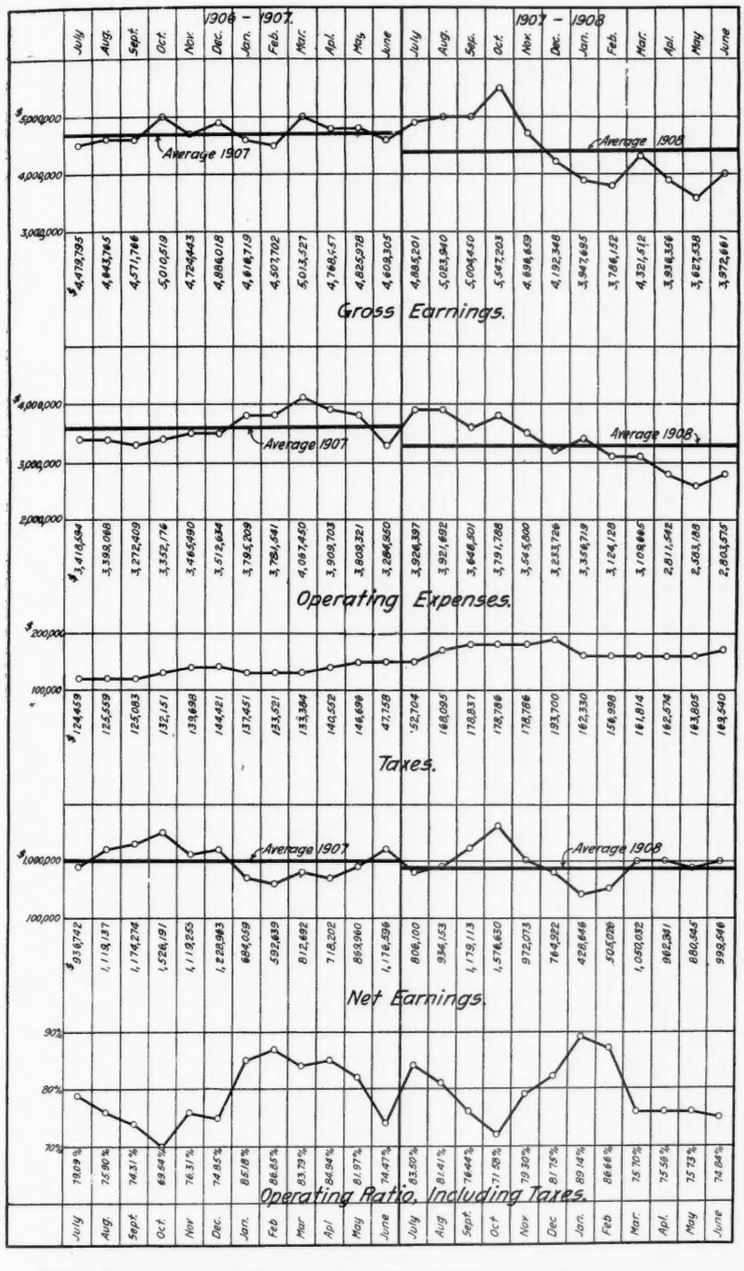
"There was thus created a new problem of management, one of retrenchment of expense of operation in greater proportion than the decline of revenues. It was realized that a saving in expenses merely equivalent to the loss of gross would not suffice, because of the constant factor of fixed charges. The fact that the facilities and capacity of the company had been built up during recent years through additions to its funded debt, now intensified the problem of maintaining the level of net earnings necessary to meet the fixed charges."

Thus does President Finley sum up the problem of the Southern Railway in the fiscal year ended June 30, 1908.

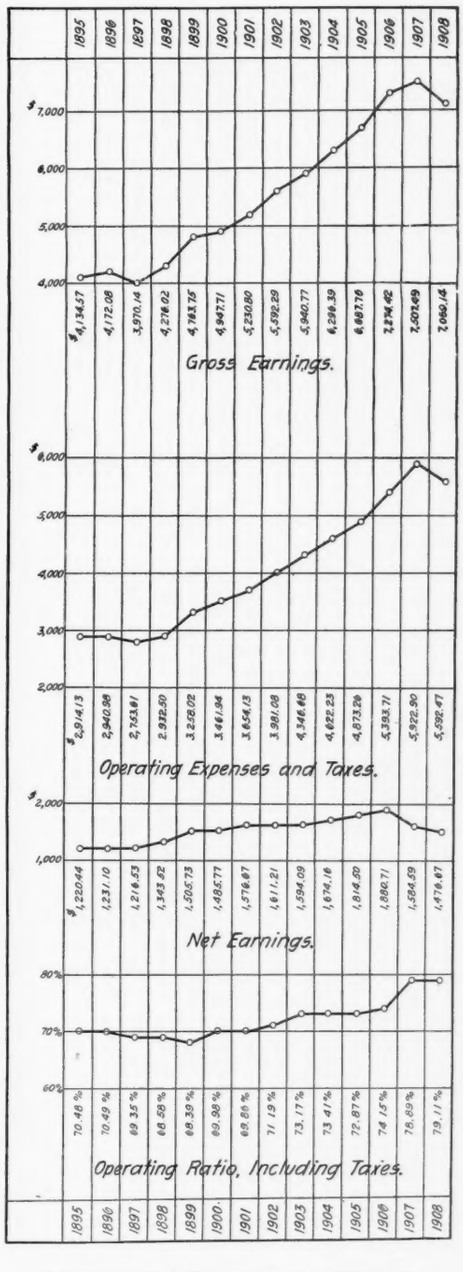
The company was in a position quite different from that of almost any other railway in the country. There were plenty of other railways having more traffic offered to them in 1897 than they were able, economically, to handle, but on almost no other road were the facilities for handling this traffic so inadequate as on the Southern, nor the possibilities of increasing those facilities so remote. The business depression for this reason was not an unmixed misfortune for the South-

operating results for the two years with the figures adjusted so as to make comparison possible. This adjusted account shows gross revenue of $52,958,713 for 1908, a decrease of 6 per cent. from the previous year, while total operating expenses, exclusive of taxes, amounted to $40,523,761 last year, a decrease of 5.69 per cent.

The decrease in total operating expenses came from a decrease of 11 per cent. in maintenance of way and structures,



Total Earnings and Expenses of the Southern Railway in the Fiscal Years 1907 and 1908.



Earnings and Expenses per Mile of Road, 1895 to 1908.

ern. It was enabled to turn its attention from problems of handling traffic to those of reducing expenses, and this problem was very successfully solved during the year, but not solved without cutting maintenance charges.

In general, the figures given in the annual report for 1908 are in the form prescribed by the Interstate Commerce Commission, and those for 1907 have not been rearranged to correspond. There is, however, a table showing some of the

6.56 per cent. in maintenance of equipment, 4.54 per cent. under transportation expenses for engine service, 6.24 per cent. for train service, and similar decreases in most other transportation expenses, with the noticeable exception of injuries to persons, for which $664,243 was spent last year, an increase of 9.91 per cent. The expenditure for maintenance of way and structures per mile of line operated was $949 in 1908 as compared with $1,015 in 1907. The unit costs

of maintenance of equipment cannot be arrived at from the figures given in the adjusted table. President Finley says the cost of maintaining engines per mile run in 1908 was 8.06 cents as compared with 6.65 cents, the average cost for the last 10 years. The average annual cost of maintenance per freight car for the last six years was $71.79 as compared with $77.03, charged against maintenance of freight car equipment per car in 1908.

The number of passengers carried increased, as did also the passengers carried one mile, while on the other hand the average passenger mile decreased, as shown in the following table:

	1908.	1907.	Per cent.
No. of passengers carried.....	14,678,241	12,842,914	Inc., 14.29
No. passengers carried 1 mile..	622,301,726	599,161,080	Inc., 3.86
Av. distance hauled, 1 passenger	42.40 miles.	46.65 miles.	Dec., 9.11
Av. rate per passenger per mile	2.300 cts.	2.451 cts.	Dec., 6.16

The tonnage of revenue freight decreased by 6 per cent. as compared with 8.55 per cent. decrease in revenue, the average haul of each ton being 154 miles, a decrease of a little over 2 per cent.; the average rate remaining the same in both years, namely, 9.79 mills.

Operating statistics show an increase in the mileage of empty freight cars, this mileage amounting to 95,540,428 last year, an increase of over 19 per cent. This is partly explained by the desire of the company to reduce hire of equipment, which cost but $172,298 last year as compared with $614,638 in the previous year. There is a gain of operating efficiency shown by a decrease in the mileage of passenger train cars, the decrease being 4.92 per cent., while, as was previously mentioned, the number of passengers carried one mile increased. But the Southern still has a good deal to gain, in the number of tons of revenue freight per train, to bring it up to the standard set by other eastern railway systems of the same size. The train load of revenue freight amounted to but 192 tons, a decrease of 4.50 per cent. from the low figure of the previous year.

The development of the South as an industrial country has been very rapid during the last few years, and the Southern Railway has fully realized that in this development lay its own hope of future greatness. Places on the lines of the road, which a few years ago were uncultivated farms, are today busy little towns. Labor for manufacturing purposes is comparatively cheap. Many of the southern states have lax laws in regard to child labor, so that cotton manufacturers have found it easy to build factories in the South and compete successfully with New England manufacturers, thus giving the railways the haul of finished goods where they previously carried cotton. Moreover, the South has been making rapid progress in the manufacture of higher class cotton goods, whereas previously it had confined itself very largely to the production of coarser forms. Efforts are being made to teach the farmers of the South to raise more diversified agricultural products and to so become partially independent of the cotton crop. The Southern Railway has one department especially devoted to this instruction, and officers are sent over the road to talk to farmers and to study local conditions. The classification of tonnage does not as yet reflect to any great extent the results of this education. The total tonnage of products of agriculture amounted to 2,500,305 tons last year. The tonnage of cotton and cotton linters was 562,591 tons as against 638,931 tons in the previous year. Products of cotton seed are the only products of agriculture that show an increased tonnage, with the exception of melons. The decrease in the tonnage of lumber and logs from 4,456,921 in 1907 to 3,871,000 tons carried last year, is probably due to business depression and not to a permanent falling off in the lumber industry in the South. The most encouraging item in the classification is that of merchandise, the tonnage of which amounted to 2,479,508 tons, or 10.94 per cent. of the total tonnage carried. This compares with 1,777,766 tons, amounting to 7.36 per cent. of the total tonnage in 1907.

There were $15,000,000 three-year, 6 per cent. convertible notes sold during the year for delivery in instalments during the calendar year 1908. The notes are secured by $20,000,000 development and general mortgage bonds and are convertible into these bonds. The report does not say what cash has been received from this sale during the fiscal year. The balance sheet shows but $3,470,694 cash in the hands of the treasurer as compared with $9,816,961 on June 30, 1907, and the current assets amounted to $15,879,174 as compared with $22,506,758 on June 30, 1907. There were rails on hand carried on the balance sheet at $3,293,850 on June 30, 1907, no such item being shown on the asset side in 1908.

Both from the operating point of view and on the financial side, the Southern is very far from being in a satisfactory condition. As was pointed out in the review of the annual report for 1907, there are many places on the line where double track is absolutely essential to handling even the present volume of freight economically, and the company already has about all the funded debt that it can take care of. Operating expenses have been reduced to a point that allows apparently for very little further reduction, and yet in some way the company must raise money to carry on improvements before gross earnings can be largely increased. President Finley faces this problem squarely, and says: "There has been no reduction during the year in the rate of wages paid to railroad employees, which, it will be recalled, had been advanced from time to time with increasing business in previous years, nor has there been any substantial abatement in the unit cost of the things which a railway has to buy in order to operate. On the other hand there has not been any compensating increase in the price at which the railway can sell the commodity which it produces—transportation. The result of advancing operating costs without any compensating increase in railway charges has been to bring about an uneconomic relation between revenues and operating costs. The problem of so changing this relation as to establish a proper margin between gross earnings and operating costs can only be solved by a reasonable advance in railway charges or such a reduction in operating costs as could only be brought about by a general lowering of the wages of railway employees, or both. One result of the lowering of wages would be to reduce the purchasing power of railway employees, and the maintenance of this purchasing power is an important factor in the general prosperity of the country. On the other hand, a moderate increase in railway charges would weigh heavily on no individual. It would seem fair, therefore, that the average level of rates now in effect should be reasonably advanced, and it is hoped that, when general business has somewhat revived, it will be generally recognized that existing conditions are unfair, and that a railway is entitled to the same consideration of equal justice at the hands of the business public which the business public has so clamorously demanded from the railways."

Difficulties the Southern has, and just at present very acute ones, but the future of the South is the future of the Southern Railway, and in many places it has a virtual monopoly of the business of a rapidly growing industrial country, rich in opportunities for agriculture and manufacture, and just at the beginning of its development. But just as surely as the future of the Southern Railway is dependent on the future of the South, so surely is the future of many parts of the South dependent on the development of the railway, and in no section of the country is hostile legislation more shortsighted than in the Southern states. What the Southern needs is encouragement and a restoration of confidence in its credit.

The following table shows the results of operation for the last two years. The figures, however, are not directly comparable since those for 1907 have not been rearranged to cor-

respond to the form prescribed by the Interstate Commerce Commission:

	1908.	1907.
Average miles operated	7,489	7,547
Freight revenue	$34,171,329	$37,368,095
Passenger revenue	14,315,961	14,683,006
Total operating revenue	52,941,717	56,657,994
Maint. of way and structures.	7,109,173	7,660,168
Maint. of equipment	9,138,378	9,576,042
Traffic	1,300,233	1,277,581
Transportation	20,773,253	22,664,019
Total operating expenses	40,506,765	43,217,667
Taxes	2,027,967	1,630,735
Net operating revenue	10,406,984	11,809,593
Gross income	12,250,906	13,370,877
Net income	401,850	2,290,321
Dividends		1,500,000
Additions and betterments	122,707	536,334
Surplus	279,143	253,987

NEW PUBLICATIONS.

The Ocean Carrier. A History and Analysis of the Service and a Discussion of the Rates of Ocean Transportation. By J. Russell Smith, Ph.D., Assistant Professor of Industry in the Wharton School of Finance and Commerce, University of Pennsylvania. 344 pages; 5 in. x 7½ in.; illustrated with five maps and with 34 photographs of characteristic vessels. Published by G. P. Putnam's Sons, New York and London, and the *Railroad Age Gazette*, New York, Chicago and London. 1908. Price, $1.50.

In view of the enormous importance of ocean transportation in the world's commerce, it is a curious fact that "The Ocean Carrier" is, so far as we know, the first book ever written which deals with the economics of the subject in a manner really full and satisfactory. There have been books without number describing the development of the ocean steamship as a machine, but Dr. Smith describes its development as a carrier. He shows where the traffic goes and where it is to be got from; why fast mail steamers are profitable on some routes, slow cargo boats on others and three-masted schooners on others. He treats the ocean as a world ocean, not as a group of unrelated waterways, and he shows how the cargo boats go from Calcutta to Dundee and from Dundee to Hamburg and from Hamburg to Buenos Ayres or Valpăraiso or San Francisco to carry out the work arranged for them by the central office. As Dr. Smith points out, it is like a game of chess; each move must be made with regard to succeeding moves, and the ship owner is glad to arrange a voyage that will release the ship in a good location to secure freight, while he is loath to send her to regions that are devoid of freight. Consequently, a cargo of lumber would be taken at a lower rate to New Caledonia, with its export of ores, than to some coral island in the mid-Pacific, with no exports but a few cocoanuts. Thus the possibility of two or even three voyages enter into the decision of the rates for one.

Dr. Smith describes the leading routes of ocean commerce and, by means of a graphic map, shows these routes in relation to prevailing winds, and makes it plain why a sailing vessel southbound from New York to Argentina crosses the ocean to a point east of the Cape Verde islands, off the African coast, in order to get the full sailing value out of the prevailing westerly winds on the north Atlantic and then exchange them for the trade-winds that will take it across the Line and down to the point where the prevailing westerly winds in the southern hemisphere begin. But the northbound sailing vessel, going from Argentina or from the Straits of Magellan, sets a course to New York many thousand miles distant from this, and so orders its voyage as to get the windward berth for these northern hemisphere west winds, so far as this can be done. The map also shows the great calm belt in the vicinity of the Panama canal, both on the Pacific side and on the Gulf side, which makes it a region dreaded by all craft that depend on the wind. This chart alone is a fascinating study, and contains an enormous amount of interesting information.

The author in subsequent chapters discusses the epoch of the merchant carrier; the origin of the public carrier; line trade and its extensions; line traffic developments; normal line organization; railway steamship lines, both on the Atlantic and on the Pacific; private steamship lines; coastwise line traffic; charter freight rates; line freight rates; rate agreements, etc. The book is written in a very interesting way and is an exceedingly important contribution to the economics of transportation. The illustrations have been selected with great care to represent characteristic types of vessels used in different services on the world ocean, and they add much to the pleasure of reading the book.

Typical Steel Railway Bridges. By W. Chase Thomson. New York: The *Engineering News* Publishing Co. 178 pages; 6 in. x 9 in.; 21 illustrations. Cloth. Price, $2.00.

The title page announces that the book is an elementary course for engineering students and draftsmen in design. That it is elementary, in a way, there is little doubt, and that it is thorough so far as it goes there is less, but to read and study it understandingly, the student must be grounded in the principles of stresses and be able to make analyses and calculations on his own account. But, given this preliminary training the book cannot fail to be of great value to any one who is starting in the work of bridge design, in that it affords a parallel example to the work that may be in hand and thus serves as a check for the always tentative and uncertain work of the beginner. The volume is offered as a supplement to the author's previous work on Bridge and Structural Design. At the outset it presents the general specification issued by the Dominion Government (the author is assistant engineer to the Dominion Bridge Co., of Montreal,) governing the loads and unit stresses, and such other details as may require attention. This is followed by tables for the permissible unit stresses in columns and for the rivet values. After this there are instructions for constructing the moment diagrams which are used in computing the bending moments and shears for wheel loads, and then the different structures are considered in detail. These details cover a rather wide range of bridges and include a 60-ft. deck plate girder; a 100-ft. Warren deck girder; a 150-ft. through Pratt truss; a 200-ft. through Pratt truss with curved top-chord; a 170-ft. swing bridge and a railway viaduct.

In the discussion of these designs every step in their completion is carefully set forth and calculations made. For example, take the 100-ft. Warren deck girder; the text starts in with the general assumption of panel lengths and depth and distance between centers of trusses. The first point taken up is that of the ties, and their size, number and weight are carefully estimated. Then comes the dead load stresses, worked out in great detail, followed by a similar treatment of the live load stresses with their reactions and the position for maximum shear and maximum moment. With this data in hand the author takes up the proportioning of the truss members, the laterals, end brace frames, the splices for the top and bottom chords, the sway bracing and camber, with a final estimate of all weights in detail. The same thoroughness is carried through all of the other bridges.

Of course these examples do not cover all of the various types of steel bridges that are in use, and this would be impracticable, but as far as the work goes it gives in great detail the processes necessary to follow in bridge design, and as such will be a valuable guide to the designer.

Secondary Stresses in Bridge Trusses. By C. R. Grimm, C. E. New York: John Wiley & Sons. 140 pages, 5¾ x 9 in.; 60 illustrations. Cloth. Price, $2.50.

The study of the secondary stresses arising in bridge structures offers problems so complicated and obscure and necessarily based so largely upon assumptions that they are frequently neglected in bridge calculations; dependence for meeting them being placed upon the ample factor of safety that is allowed. To quote from the preface: "The deflection of an ideal truss with frictionless pins, due to external forces, causes alterations of lever arms, which the computer of primary stresses completely ignores, and rightfully so, since these alterations have no practical significance whatever. The original lever arms are very great in comparison with the

alterations that have taken place after deflection and, therefore, these changes are neglected." Still the matter is an important one, and the book under consideration sets forth the various methods that have been proposed to reach a solution. In the discussion of the subject, it is assumed that the external forces, to whose influence the truss is exposed, are acting in the plane of the truss—assumptions which are never strictly realized in a structure. After stating the nature of the problem its solution is taken up in detail, and in an analysis of its various elements the author takes up the several methods that have been proposed and gives them a critical mathematical analysis. These are the methods of Manderla, Muller-Breslau, Ritter, Mohr, and the method of least work.

Then follows a chapter on the causes of secondary stresses such as eccentricity of loading, changes of temperature, misfits, unsymmetrical connections, curved members, friction at supports and the yielding of foundations and settlements of masonry. The difficulty of calculating the results of these causes is well summed up in the chapter on impact where the author says that, "if every element had to be considered which has some connection with the effect produced on a bridge by a fast-moving train, then the problem of impact would, of course, be insoluble, and even in the simplest case. But barring such elements, as, for instance, a defective track, or inequalities of the rail ends at splices, etc., whose influence is naturally outside the province of calculation, the mathematical difficulties presented by the problem are almost unsurmountable." With these facts in view the best that can be expected is to arrive at an approximation to actual conditions whose error cannot even be determined. The study is, however, valuable and the author has laid down methods of work that, with given hypotheses, will lead to accurate results, as far as the hypotheses themselves are accurate.

In the last chapter there are some examples taken from foreign sources, chiefly from Prof. Patton's book on the subject, and the concluding paragraph contains the suggestion that "our knowledge of secondary stresses could be improved either in measuring these stresses by the use of suitable instruments, or by analytical investigations or both."

Letters to the Editor.

TRACK SUPERSTRUCTURE IN TUNNELS.

Chicago, Nov. 16, 1908.

To the Editor of the Railroad Age Gazette:

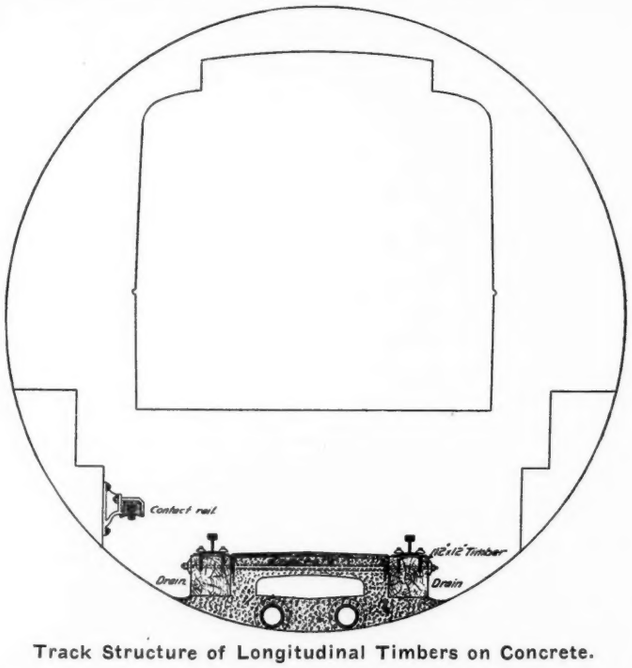
Referring to the subject of "Track Superstructure in Tunnels," which was treated in a leading editorial in your issue of November 6, and also the types of track superstructure which are being considered by the Pennsylvania Railroad for use in its tunnel on the New York-Long Island extension, illustrated and described on page 1304 of the same issue, I offer the following discussion:

The illustration of the proposed form of track superstructure for the Pennsylvania tunnel is practically the same in principle as one of those in use in the Philadelphia subway, which was illustrated in your issue of August 14, 1908. There are two forms of track in use in that subway, one of them having short ties bolted to 12-in. channels for the express tracks, and the other for local tracks has the short ties resting directly on the concrete.

This is essentially a concrete floor, properly drained, upon which are laid short cross-ties under each line of track rails, primarily to cushion the effect of the moving load. In principle this is practically the same as all of the track superstructures so far built in tunnels or otherwise, inasmuch as it involves the cross-tie system of support. The use in some cases of the short cross-ties, the bedding of the same in concrete, at their ends or throughout their entire length, the provisions for drainage, etc., are of secondary importance, so that the question of the independent cross-tie support, versus longitudinal support, a question as old as the railway itself, will be once more revived.

In all forms of cross-tie support, the difficulty is to get a uniformly rigid support for the rail. This does not mean that if each tie has a rigid support that the rail will be supported *uniformly rigid* throughout its entire length. Far from it; there may be as much variation in rigidity between the several so-called rigid supports as there is between an apparently rigid support and one that is loose. That is as far as our senses can go.

Moreover, it is well known that timbers of different kinds have great differences in density and resilience; and, even in timbers of the same kind, there is found so much difference in their densities that it is sometimes difficult for an experienced lumberman to separate them. Witness the large variation in the amount of creosote absorbed by cross-ties which are cut from the same tree, as much as 100 per cent. in some cases. Again, it is well known that the track rail itself, that patient beast of burden that has had to carry the blame for



Track Structure of Longitudinal Timbers on Concrete.

all the shortcomings in our track superstructures, will sometimes be so incorrigible as to have some hard spots in it; so that everything militates against the object to be attained, that is, a smooth-riding track.

But, when we come to the bottom of this story, the crowning blunder remains to be told. If it were practicable to lay the track rail first, with its cross-ties all in place, shimmed up against the rail, so as to give the rail a uniform support, and then put the concrete floor under it, there would perhaps be no necessity for any discussion of this subject. But, it is a long cry from what has been outlined above to that which is being done to-day, and that which has been done since the advent of the cross-tie system.

The early pioneers in railways contemplated an entirely different form of track from that which has been so universally adopted. They laid two stringers on cross-ties, and in order to make a wearing surface for the wheels on the stringers, they introduced the strap rails, which were spiked to the tops of stringers. This may sound crude, but if this form of track had been developed along those lines, the present form of track would have been unknown.

The present form of track always contemplates a support

which can be adjusted, and which can be shimmed. All of the rigidly supported tracks have been made by laying the concrete floor first. To lay this true to grade is impossible, so the cross-ties are laid on the concrete and the final adjustment is made by either shimming the cross-ties or cutting them down to the required level. In this operation the eye again is the only guide to a perfectly level track, surely a crude process. A departure from this was made in the case of the Baker Street & Waterloo Railway (London), and in the recently constructed street railways in Chicago, where the ties, with the rails resting on them, were bedded in the concrete. In the first case (London), the ends of the ties are free to bend, the ends being bedded in ballast. In the second case (Chicago), the ties, with the rails on them, are laid on the ballast throughout, when the ballist is tamped firmly under them, so as to give each tie a firm bed; the concrete is then poured around them up to within about four inches of the head of the rail, or enough for the paving that is to follow. Again the eye is the only guide.

In all previous cases, where the ties had been laid directly on the concrete, disintegration followed. Witness the "Tuppenny Tubes" in London, where damage suits resulted from the vibrations due to this track. Judging from the proposal to use "cow-hair felt" cushions in the Pennsylvania track, it does not seem that their engineers are quite sure of their ground.

In view of the past experience with all forms of rigidly-supported track, it is doubtful if the proposed track for the Pennsylvania tunnels will meet the requirements of the heavy traffic that is to come. Then, what is the remedy? The answer is to construct a track on mathematical lines, with the instrument, and not the eye, by laying first a substructure of concrete to an approximate level. (See cut herewith.) Upon this substructure is laid two lines of timbers, with the track rails, etc., on them. When the track is adjusted to grade and alinement to a mathematical nicety, by means of shims under the timbers, the concrete superstructure is poured around and under them, leaving the shims behind, if necessary. Such a track needs no adjustment, and with a true wheel and a hard rail should last forever, barring the timbers which can easily be renewed. This form of track was discussed by the writer before the Western Society of Engineers (see *Railway Age*, May 31, 1907), but has never been tried, even experimentally.

However, the advent of the high manganese rail, which is now a fact, will bring the track rail to its true heritage, that is, to serve as a wearing surface for the wheels, and not as a girder to carry loads, as it does now. J. W. SCHAUB.

MOTOR CYCLE SPEED RECORD.

New York, November 21, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Answering your inquiry in your editorial on page 1378, November 20 issue, relative to the record for speed of the motor cycle. The world's record, I believe, is held by G. H. Curtiss, of Hammondsport, N. Y., who rode a mile in 26⅘ seconds in 1908. A. E. HOOVEN.

DEMURRAGE BUREAUS IN OHIO.

November 23, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The item in your last issue, page 1411, to the effect that the four principal demurrage bureaus in the state of Ohio are to be discontinued from April 1, 1909, is of considerable interest, but what is the rest of the story? At first the date was fixed as October 1, 1908. Later, January 1, 1909, was said to have been agreed upon. Now April 1, 1909, is the date named. Some who are close to the matter express a doubt of its ever taking place.

The plan contemplates that each railway operating in the state will apply its own demurrage rules, and make its own adjustments of claims for cancellation or refund of demurrage charges. This is to be done either through the freight claim department or through the office of the superintendent of car distribution of each railway.

A bureau is proposed, however, to have jurisdiction throughout the state. This bureau is to keep no records of car detention, or of demurrage earnings, collections or refunds. It is to consist only of a manager and a force of traveling instructors, who will help the station agents and clerks to a proper understanding and application of the demurrage rules; probably reporting to each road any infractions of the rules, and to a state committee of railway officers matters of general information connected with demurrage.

The trouble with this plan is that it is incomplete. This is due, perhaps, to the fact that its advocates have never been in position to get a comprehensive view of the demurrage question. There are too many cooks stirring this broth, with the usual result.

A state bureau of inspection is all right as far as it goes. The same inspection work is now being done by the several bureaus operating in the state. But, unless the state bureau is required to review and control the cancellations and refunds, made for a great variety of reasons, discriminations are bound to arise out of the varying personal interpretations by honest men, to say nothing of the purposeful misinterpretations of dishonest men, or, to put it mildly, the specious interpretations of men engaged in competitive solicitation of freight. A state bureau could not supervise this feature of demurrage, owing to its magnitude, except through departments corresponding to the several bureaus now in operation. Some intelligent shippers already recognize the fact that if demurrage matters are to be handled by the officers of individual roads, independently of bureaus, favors will go to the shipper who can make the strongest demand, and the nature of the business is such that favors can be extended without probability of detection.

The original plan of conducting demurrage rules through an impartial bureau serving all roads and all shippers alike was right, and still is right. The bald fact seems to be that, now, under the pressure of the law requiring unvarying compliance with rules or tariffs, the railways cannot agree among themselves to a uniform set of rules and an absolutely impartial application of them. The irony of the case lies in the fact that the law which was designed to insure uniformity and impartiality is made the excuse by some for efforts to break down the machinery for accomplishing impartiality.

Certain short-sighted railway men desire to go it alone, in order, as they say, to comply with the law, and not be jeopardized by agreements with roads that are indifferent to the law. These men, whose ability to do damage is increased by their honesty, seem quite unable to recognize that they can fully comply with the law themselves, as members of the bureau, and, by means of their membership in the bureau, exercise a strong influence for the honest conduct of their competitors. Another class of railway officers recognize that if the bureaus are abandoned they can do about as they please in matters of demurrage without fear of detection.

At this very moment there is practically a war being waged between a few of the big roads in Pennsylvania and New York in demurrage rules. By independent action each road is trying to outdo its competitors in extending the free time allowed for loading or unloading cars by big shippers. Nothing is being done to extend the time allowed to the little fellows. While cars are plentiful this is going unnoticed, except by the little railways who own but few cars, and who have to pay per diem on borrowed cars. The little road, of course, in competition with its big neighbor, has to extend the free time as far as the big road does, increasing its per diem expense. When cars become scarce perhaps the public will awaken to what is going on. N. B. T.

Contributed Papers.

SIGNALS FOR THE CORTLANDT STREET TUNNELS.

An account of the contract which has been taken by the Union Switch & Signal Co., Swissvale, Pa., to install block and interlocking signals in the Cortlandt street tunnels of the Hudson & Manhattan, was given in the *Railroad Age Gazette* of November 20, page 1415. The drawings printed herewith show the location of these tunnels and also the arrangement of the block signals and the automatic stops. The block signals are controlled by the track circuits of three blocks ahead, so that the system is "two-block overlap." This arrangement is on the same principle as that adopted in the tunnels between Hoboken, N. J., and Morton street, New York City, which are already in operation. It will be seen that on that part of the eastbound track close to the Church street

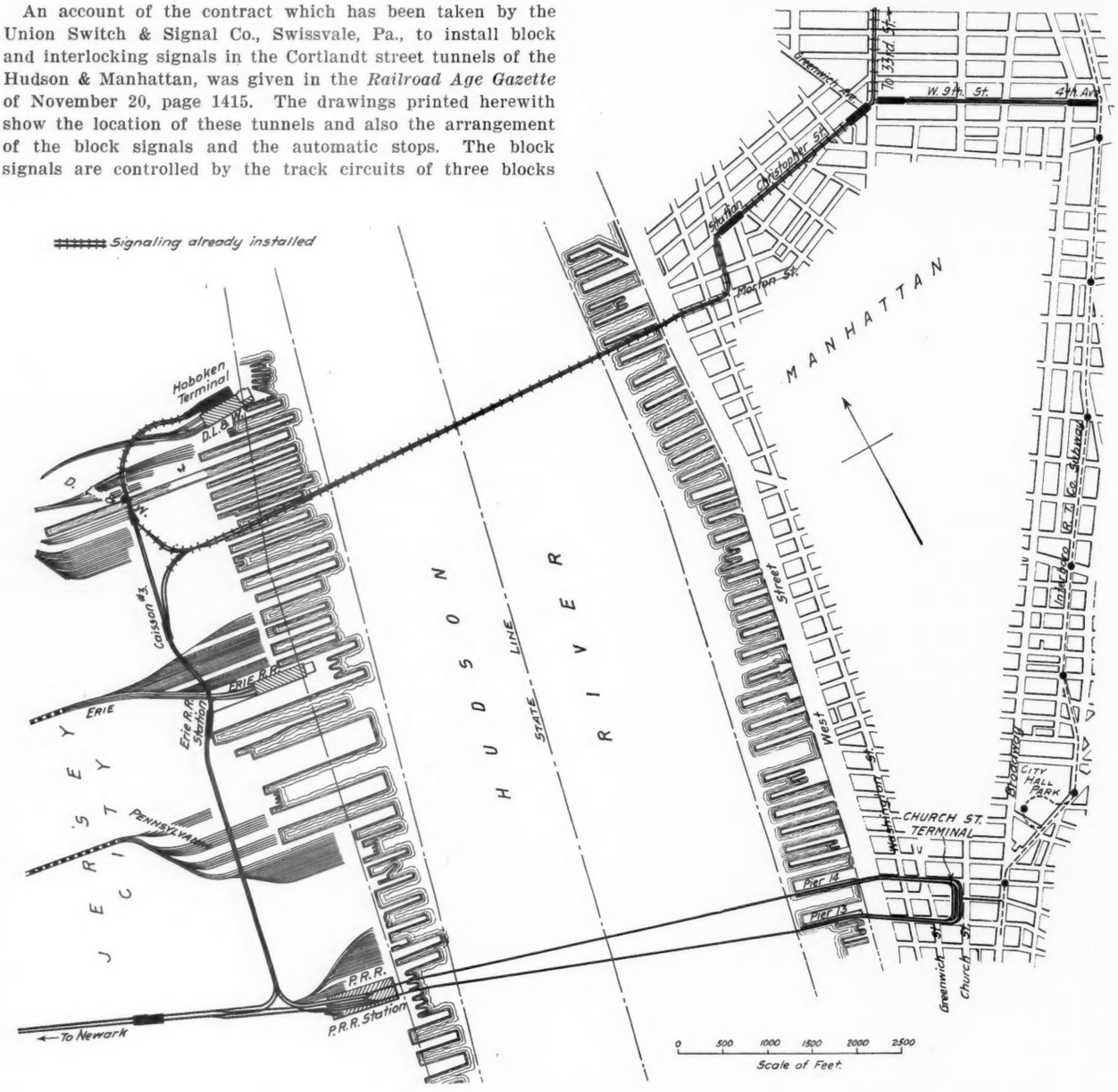


Fig. 1—Tunnels of the Hudson & Manhattan Railroad.

The Cortlandt Street tunnels, referred to in this article, are at the bottom of the drawing. The cross-marked lines are already signaled and in operation.

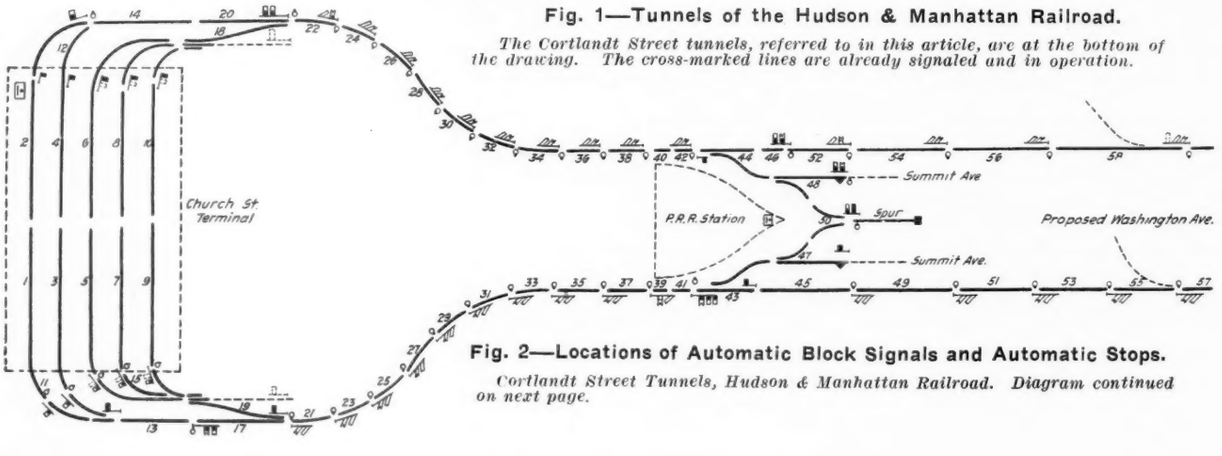


Fig. 2—Locations of Automatic Block Signals and Automatic Stops.

Cortlandt Street Tunnels, Hudson & Manhattan Railroad. Diagram continued on next page.

terminal, the block signals are very close together, making it possible to admit successive trains to the station with the least possible delay. In Fig. 1 the yard tracks of the Pennsylvania, the Erie and the Lackawanna Railroad (on the surface) are shown light lines, giving a rough idea of the situation of the tunnel as related with the tracks of the surface companies. The Hudson & Manhattan lies many feet below the surface. As will be seen, it runs directly beneath the passenger station of the Pennsylvania. The lines westward from the Pennsylvania station toward Newark will not be finished for several months yet. The tunnel stations marked "Erie Railroad" are to be connected by elevators with the terminal passenger station of the Erie, on the surface.

At Fourth avenue and Ninth street, Manhattan, the Hudson & Manhattan subway will connect with the existing subway operated by the Interborough Rapid Transit Co. This fourth avenue branch will not be open for several months.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

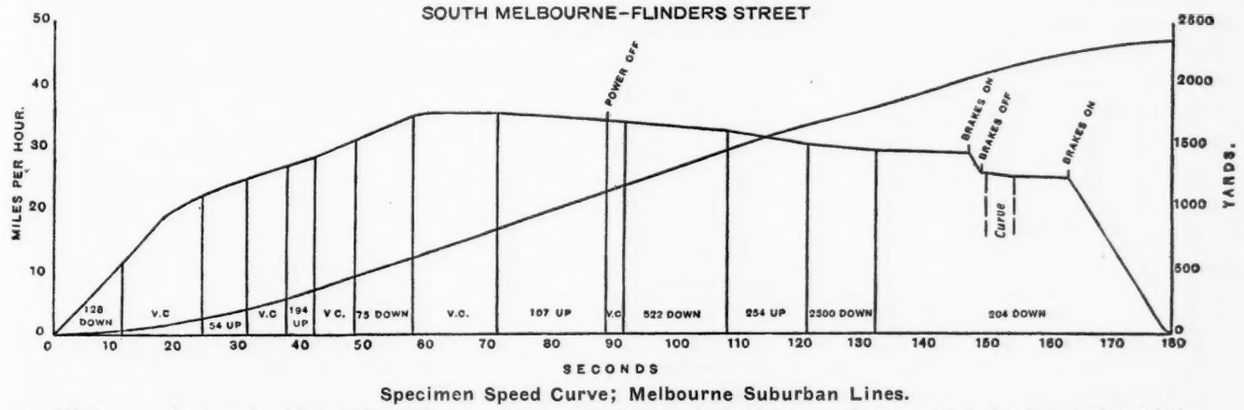
IV.

Although, for the reasons stated, I have adopted a conservative estimate for the 1912 traffic requirements, the whole system has been designed with considerable margin, so that should the traffic on any section exceed the assumed figures no inconvenience will result; not only has ample margin been allowed, but the whole system has been so designed that extension of any portion of the equipment can readily be made without sacrificing in any way capital already spent. As regards rolling stock equipment, new coaches are, of course, easily arranged for at any time. I think, therefore, that 25 per cent. increase of traffic is a sound basis to proceed on, and I may repeat that there would be a considerable improvement in the financial results if the traffic estimates should turn out to be somewhat under the mark. A time table has, therefore, been prepared on this basis.

Table II gives a synopsis of the time table for the different routes and also a comparison between the proposed and the existing schedule speeds. This time table is based on the discussions which took place in Melbourne, and is, I agree, a wise one to commence with. I think it quite possible, if an electric traction scheme be proceeded with, that an increase in this train service may prove justifiable, but it is easier to give the public a better service than to reduce it, and therefore, it is good commercial policy to commence with a service on the low side.

There is one feature of electrical operation to which special attention has been devoted in drawing up this time table, namely, the desirability of keeping a uniform and frequent service of trains on each line throughout the day. It is, of course, necessary to insert additional trains at the busy times, and this has been done, but as electrical working, compared with steam working, allows of such a uniform service of trains being run at a minimum of expense, it is, in my opinion, very desirable—in fact, essential—that such a uniform and frequent service should be maintained throughout the day. This is obviously a great convenience to the traveling public; they can rely on catching a train without having to consult a time table and are encouraged to travel at all times—not merely at the accustomed times of rush traffic, but during the, at present, slack portions of the day.

Apart from this convenience to the public, it is most profitable to the railroads to encourage as far as possible traveling at times of light traffic. Every additional train run at busy times ultimately means additional capital expenditure and operating expenses on power station, feeders, sub-stations and rolling stock; it also results in difficulties in arranging for the necessary motormen and guards. Such additional trains, however, are necessary since it is the duty of the railroads to cope with the traffic presented, but the capital having been once spent, very little extra expense is entailed by maintaining a uniform and regular service throughout the day. Such a service undoubtedly promotes travel during the slack hours



Specimen Speed Curve; Melbourne Suburban Lines.

128 down = down grade of 1 in 128. V. C. = vertical curve. Curve = horizontal curve sharp enough to involve speed restriction.

*Abstract of the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

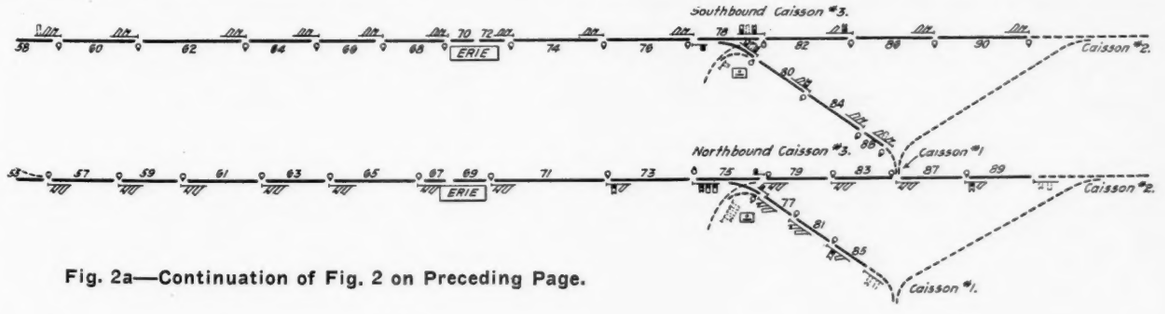
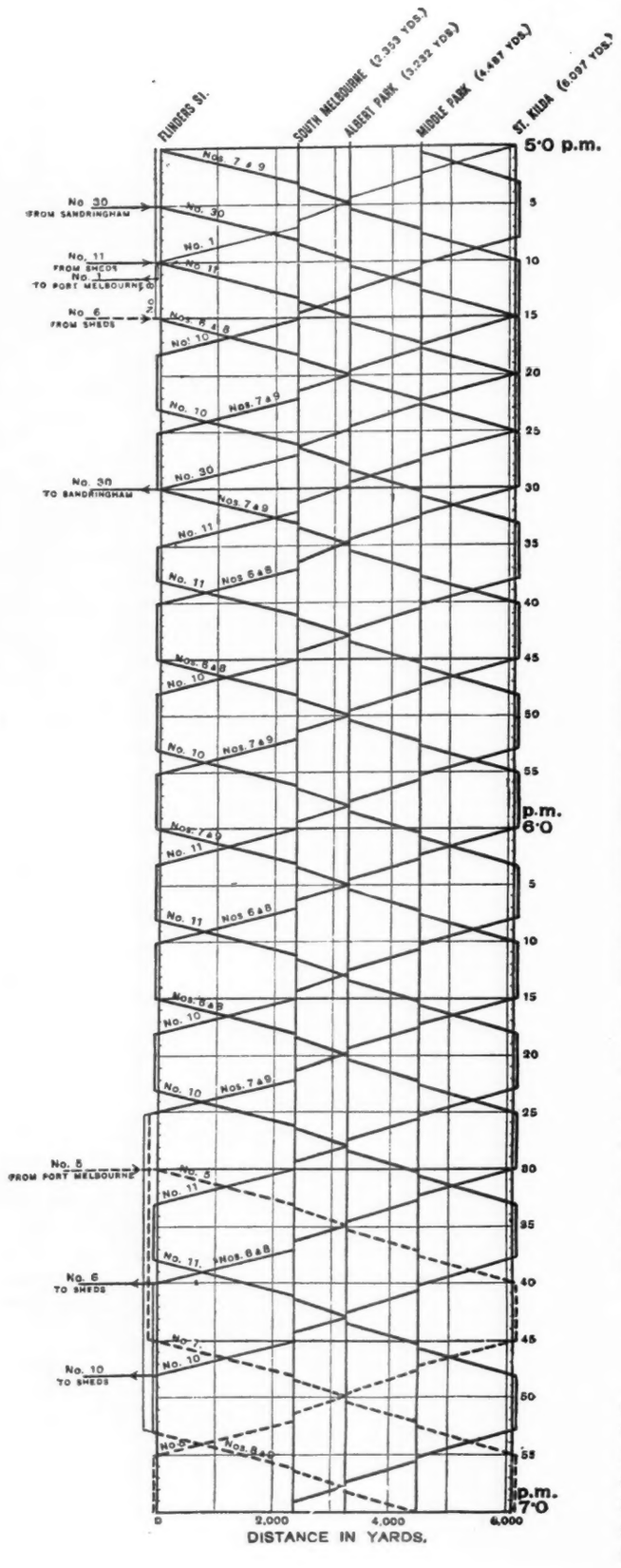


Fig. 2a—Continuation of Fig. 2 on Preceding Page.



——— = 6-coach train.
- - - - - = 4-coach train.
——— = 2-coach train.

Train Sheet; Melbourne Suburban Lines.

when every additional passenger represents revenue, which is practically all profit, as compared with additional passengers carried during rush hours. This—the difference between the profit made out of a passenger depending on the hour of the day at which he travels—is true of all systems, but the difference is greater with electrical working than with steam working, because with electrical working the capital charges (which depend on the maximum rather than on the average traffic) are of more importance relatively to the operating expenses than they are with steam. Again, with electrical operation and especially with the multiple-unit system which I recommend for the operation of your suburban service, it is possible to run short trains at regular and frequent intervals with maximum economy. With electrical working, therefore, a frequent service should be maintained throughout the day.

TABLE I.—*Summary of Proposed Time-Table and Comparison with Steam Service.*

Route.	Number of trains per day in each direction.		Number of down trains starting between 5.30 p.m. and 6.30 p.m.		Average time for journey. Minutes.		Percentage increase in schedule speed.
	1906 steam service.	1912 electric service.	1906 steam service.	1912 electric service.	1906 steam service.	1912 electric service.	
Leaving Flinders St.							
North Melbourne ...	146	264	16	20	8	6½	23
Footscray	53	104	6	7	14½	12½	16
Newport	47	81	5	5	26½*	21½	23
Williamstown	40	75	4	5	37*	31	19
Footscray West	6	23	1	2	20	16½	21
Sunshine	6	21	1	2	28½*	23½	21
Essendon	70	88	7	9	22½	18½	22
Broadmeadows	10	22	1	2	44	34½	27
Coburg	23	72	3	4	26½	23	15
Richmond	242	317	31	41	4	3¼	23
Burnley	95	126	13	16	9	7¼	24
Hawthorn	92	126	12	16	12	10	20
for—							
Camberwell	70	94	9	12	20½	16½	24
Canterbury	41	76	7	6	27	21	28
Box Hill	35	74	4	5	36	28½	26
Ringwood†	8	18	1	1	59	43½	36
Darling	12	21	2	2	33	24½	35
Kew†	50	75	3	4	16	14½	10
Deepdene	13	19	2	2	35½	26	36
Ashburton	12	19	1	1	38½	31	24
South Yarra	147	191	18	25	8	6¼	28
Caulfield	72	95	11	12	22½	18½	22
Oakleigh	29	41	3	4	32½	27	20
Dandenong†	4	17	—	1	55½	46	21
Mordialloc	14	20	2	2	55	45	22
Elsternwick	75	96	7	13	20	16	25
Brighton Beach	52	80	5	7	32*	25½	25
Sandringham	28	73	3	5	38½*	31	24
St. Kilda	70	86	6	9	13‡	10	30
Port Melbourne	62	72	5	5	9	8	13
Leaving Princes Bridge for—							
Clifton Hill	93	122	8	10	14	11½	22
North Fitzroy	25	39	2	3	18	15	20
Preston	22	43	3	3	36	30	20
Heidelberg	23	39	2	3	31½	25	26

*A new station has been opened on this route since 1906, and therefore in order to obtain a comparison with the electric service this figure has been taken from the 1907 time table.

†In these cases the service is partly through and partly local, but the times given refer to through runs; when passengers have to change trains these times must be increased.

‡Since 1906 the speed of steam trains on this route has been increased by 9 per cent.

(To be continued.)

THE ITALIAN ARMY AND THE STATE RAILWAYS.

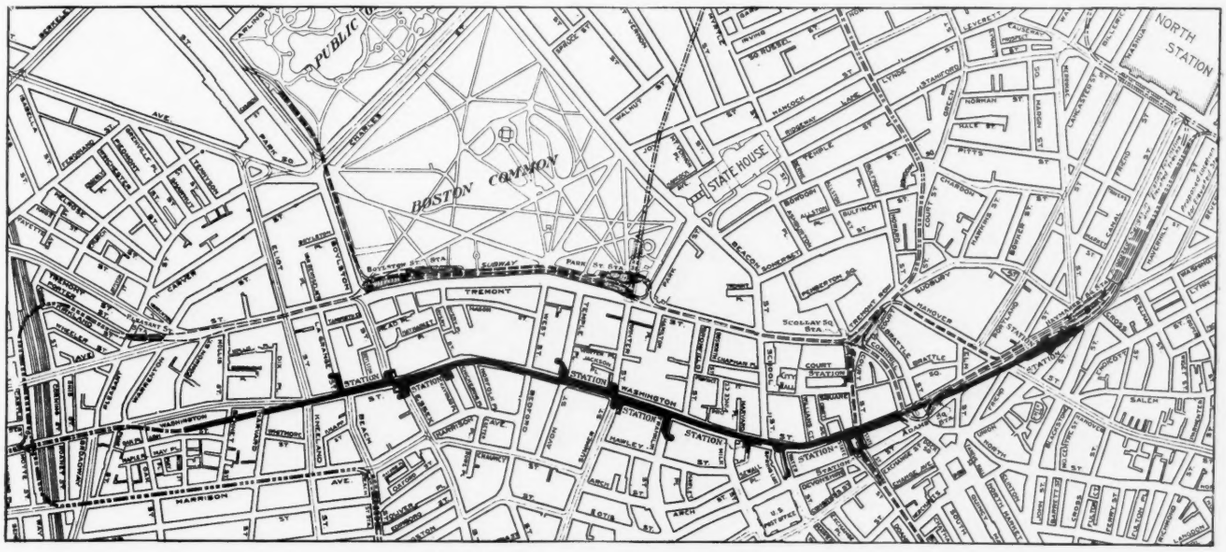
The ministers of war and of public works have recently made an important innovation in the matter of the participation of the army in the railway service. Starting June 1, 1908, one hundred soldiers of the engineering corps were assigned for duty for six months as employees of the State Railway, in order to learn the duties of signalmen, brakemen and conductors. At the end of six months these will be replaced by 100 others, who will serve for six months, and so on. On leaving the army these soldiers will be expected to take advantage of the training thus received and enter the railway service. In this way 200 soldiers will be instructed annually, and they will be available for that work in case of a mobilization of the troops or of a strike.—*Journal des Transports.*

WASHINGTON STREET TUNNEL, BOSTON.

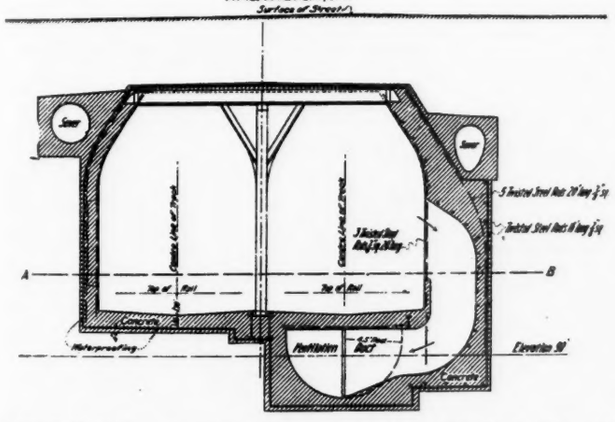
BY JOHN S. HODGSON.

The Washington street tunnel, opened this week, will be the third instalment of underground transit facilities provided by the Boston Transit Commission. They are the outcome of legislation beginning with the act of 1894, under which the pioneer Tremont Street Subway, 1.8 miles in length and including 0.76 miles of four-track work, was constructed at a cost of about $4,370,000.

The legislature of 1897 authorized the connection of the city proper with East Boston by means of a tunnel or tunnels passing under the harbor at a clear depth of 40 ft. below mean low water. A single tunnel, of reinforced concrete, was finally decided on. Some of the more interesting features of this were described in the *Railroad Gazette* of April 10, 1903, page 259. With a total length of about 1.4 miles, of which 0.67 mile is under the harbor, its cost amounted to about $3,200,000. As shown on the accompanying map, it connects at its westerly terminal in Scollay square with the Tremont Street Subway, as stipulated by the act of 1897, but this connection at grade will have to be replaced by a sub-station whenever the capacity contemplated in the general design is called for by the increase of traffic.



Washington Street Tunnel, Boston.



Cross Section at Eliot Street, Showing Opening into Air Duct.

The Washington Street Tunnel, authorized by the legislature of 1902, lies to the east of, and nearly parallel to, the original subway. Its purpose is to provide for trains of elevated cars now using the subway, contrary to the original purpose of the latter. It is entered from the south by an incline connected with a new elevated railroad structure, designed to divert elevated trains from the existing connection with the subway at Pleasant street. Following Washington street for the greater part of its length, it passes under the East Boston tunnel at Court street and under the subway in Adams square, closely adjoining the latter until connecting by an open incline with the elevated railroad in Causeway street, close to the North station.

Not including the open incline, the tunnel is about 6,100 ft. long. Approximately 50 per cent. of this length is straight, 33 per cent. has a curvature of about 5,000 ft. radius, 2 per cent. of about 1,800 ft. radius, and 15 per cent. of about 500 ft. radius. About 40 per cent. of the entire length is level, 7 per cent. has a grade of less than 1 per cent., 22 per cent. a grade of about 2 per cent. and 13 per cent. from 3¼ to 4 per cent. Northbound trains will descend 48 ft. from the elevated railroad at Broadway to Eliot street, where the track is 6 ft. below mean low water; they will ascend about 52 ft. from a depth of about 16 ft. below low water under the subway at Adams square to the elevated structure at Causeway street. Referring to the profiles, the most noteworthy divergence of grades in the north and southbound tracks is in Section 5, having a maximum depth of 48 ft. below the street. The northbound track is here carried under the platform for southbound cars and a passageway from the State street entrance, as shown in cross-section. A platform 14 ft. wide is thus obtained within the limits of the ordinary tunnel width. North of the old South Meeting House the platform width is increased to 30 ft. for a distance of about 100 ft.

The general inequality of north and southbound grades was a factor in the extended adoption of columns between the tracks, a feature regarded as undesirable under the different conditions existing in the original subway.

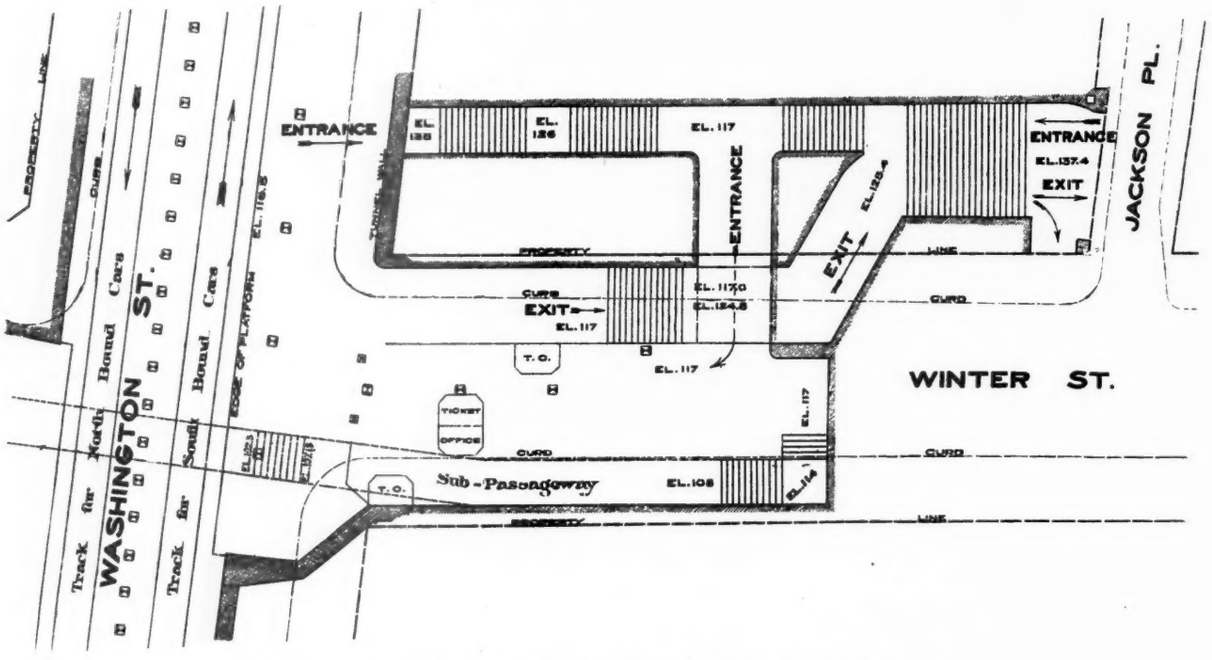
The narrowness and crookedness of Washington street are responsible for the staggered arrangement of the station platforms, those for north and southbound traffic not being opposite each other. The varied situation and use of the tunnel have dictated corresponding differences of cross-section, some of which are illustrated in the present article. Thus, south of Kneeland street, where the tunnel is wholly in private land east of Washington street, it was necessary not only to furnish adequate support for existing buildings but to provide for the taller and heavier structures permissible under the building laws. These conditions were met by a heavy

roof of steel beams and concrete, supported by reinforced concrete side walls and a line of steel posts between the tracks. North of Kneeland street, *i.e.*, under the surface of Washington street, the roofs of the staggered station platforms are formed of steel beams and girders with concrete arches between. The large proportion of this type of construction is due not only to the staggered arrangement of stations but to the 350-ft. length of platform needed in each instance to accommodate trains of eight cars. In the lengths between stations, and where a considerable depth exists, the tunnel is covered by a concrete arch with steel tie rods.

In all parts of the work provision is made for the contingency that the pressure of the earth may be removed on either side of the tunnel while a heavy load is being carried on top and pressure is exerted by the earth on the other side. A similarly conservative principle was adopted where passing under buildings in the more northerly part of the tunnel, more especially between Hanover and Union streets. In view of the possibility that future owners and tenants might desire to erect heavier stories and to distribute heavier loads over the floors of buildings, considerable latitude in this respect is afforded by rendering possible the transmission of such loads to the heavy columns, girders and foundations of the tunnel structure.

Section 5 of the act of 1902 prescribes that construction work in the tunnel, "under or near public streets and places, shall be conducted, so far as practicable, in such manner as to leave such streets and places, or a reasonable part thereof, open for traffic between the hours of eight in the forenoon and six in the afternoon of each secular day except public holidays." The operation of this provision, as affecting the methods by which the tunnel has been constructed, is succinctly described in the eleventh annual report of the Commission, dealing with the year ending June 30, 1905:

"Most of the sewer, water and gas pipes and other structures under the street require to be moved to a new position and many service pipes are to be laid cross-wise to connect with the different buildings. For these reasons most of the earth from the pavement down to the bottom of the tunnel is necessarily taken out. The work, however, has been carried on in such a way as to interfere but little with the traffic of the street. The method of doing the work has been similar to that employed on the streets when the original subway was built. The paved surface of the street has been replaced little by little with heavy planking laid flush with the original surface of the paving and supported on timbers, and most of the work in the daytime has been done under this bridging. During the night much more of the surface of the street is occupied, but nevertheless enough space is left free so that fire engines and apparatus can pass through Washington street and in and out of any adjoining street, and this provision permits the passage of the comparatively few teams used in the night. On Sundays and holidays the street surface is occupied in places in putting down new bridging and in doing other work for which the time in a single night is too short. The street railway cars are not diverted from Washington street in the day time except in case of emergency, but either the north or the southbound line, or both, are often diverted at night and on Sundays. * * * The order of doing the parts has generally been somewhat as follows: underpinning is done where necessary; side walls are built in narrow trenches, one at a time; new sewers are built in or near them; interior posts, if any, are placed in a narrow trench; the roof is put on; the core is dug out, and finally the invert is completed."



Entrance and Exit at Winter Street; Washington Street Tunnel.

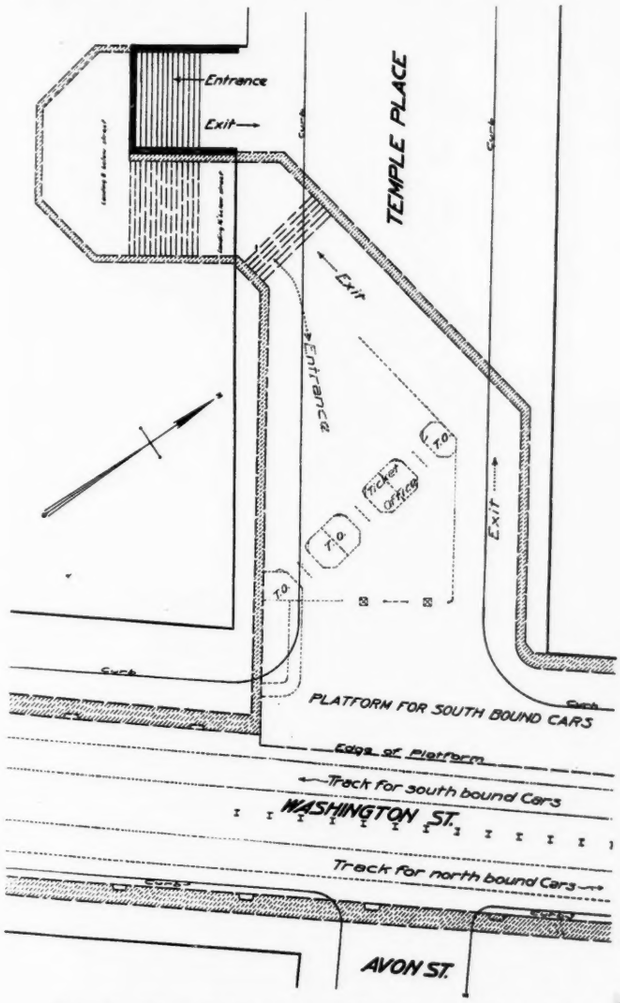
These operations, it should be noted, usually refer to 16-ft. lengths of tunnel.

The twelfth annual report amplifies the foregoing statements, with special reference to Sections 4 and 5, located in the busiest part of Washington street:

"The disturbance of the street surface in business hours has been restricted to small openings near the curbs, 100 ft. apart, for the placing of concrete and passing building and bracing materials in and out of the trenches. In the other sections, excavation has been permitted in the day, but the contractor has been limited to the use of spaces not exceeding 30 ft. in length by 10 ft. in width and at least 100 ft. apart. In some isolated cases one-third of the width of the sidewalk has been used for construction purposes. * * * Fires in contractors' engines have been so managed as to produce as little offense from smoke as practicable, and smoke, fumes, and disagreeable smells have been kept out of premises as far as possible. To lessen the annoyance from these causes and to avoid danger of fire, most of the lighting has been done by electricity."

Where the tunnel passes under buildings, or where its

close proximity to them renders underpinning necessary, interference with business occupancy has been minimized by erecting tight matched-board partitions, covered with asbestos, in basements and cellars, so as to provide a working space, 5 ft. wide, leaving the remaining space unaffected. The so-called cantilever method of underpinning was used in most cases. Heavy steel I-beams were placed parallel and close to the building line, their ends being supported outside of the lines of the hole to be excavated. Other I-beams, at right angles, were hung by heavy bolts from the former, with ends projecting under the pier. The outer ends being weighted, or fastened to the tunnel structure already in place, upward pressure was applied to the pier by turning up the bolts. This preliminary support enables the underpinning of



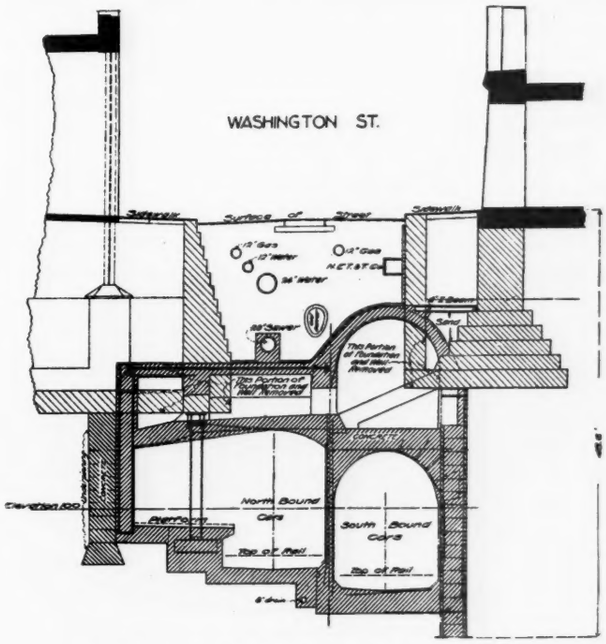
Temple Place Entrance and Exit to Platform for Southbound Cars.

the buildings to be done without entering into the basements.

The front wall of the heavy Sears building, at the southwesterly corner of Washington and Court streets, was about 6 ft. distant from the trench in which Section 6 of the tunnel was built. In this case, pockets 6 ft. in length were excavated and filled with corresponding lengths of side wall before the adjoining pockets were excavated.

The Ames building, at the opposite corner of Court street (the East Boston Tunnel intervening) offered a still more difficult problem. Though reaching over 200 ft. above the earth on which its foundations rest, this is not a steel frame building, the street walls being of stone with brick backing. The bottom of the tunnel masonry at this point is 48 ft. below the sidewalks and 28 ft. below the foundations of the building, which project into the street nearly the entire width of the sidewalk, as shown in the drawing, while the westerly wall of the tunnel substantially coincides with the building line of the street. The retention of the encroaching foundations having been decided on, it was determined to form the westerly side of the tunnel of a series of hollow piers, each one being begun at the top, *i.e.*, immediately under the foundation, and extended downwards, step by step, to the required depth. The piers were made hollow, in their earlier stages, not only to allow of excavation being carried on inside but because it was necessary to unite, as a monolith, the reinforced masonry of the arch and invert with the masonry ultimately filling the hollow piers and constituting a large part of the tunnel wall.

A trench was first excavated along the front of the building to the bottom of its foundation, and from this a 4-ft. x 4-ft. drift was driven, at right angles under the foundation, extending to the back of the proposed tunnel wall, the supporting power of the removed earth being replaced, as far as possible, by a row of jacks on each side of the drift. From the farther end of this drift a 3-ft. x 3-ft. 9-in. shaft was



Cross Section 50 ft. North of Court Street.

then driven upwards, on the line of the tunnel wall, to about 3 ft. below the bottom of the invert, the walls of this vertical shaft being formed of reinforced concrete slabs, fastened together vertically and horizontally by splicing angles bolted in the inside corners of the shaft. Steel foot-plates were driven outwards from the interior of the pier, projecting 9 in. beyond its external faces and temporarily increasing the footing area until permanent support was supplied by building the tunnel invert. The bottom of the pier was then plugged with about 3 ft. depth of concrete and the proper portion of the building load was transferred to the pier by steel wedges driven between the bottom of the building foundation and steel I-beams bedded on the pier lining.

This process was repeated until 34 piers, touching each other, formed a cellular wall 3 ft. thick, all spaces around and between them being filled with grout. For about one-third of the piers, sunk in soft ground, rectangular steel shields, about 3 ft. deep, were jacked down as the excavation proceeded, the concrete slabs being bolted in place behind them as they progressed. The shields were left in place at the bottom of the pier. As soon as the combined underpinning and tunnel wall was in place the westerly barrel of the

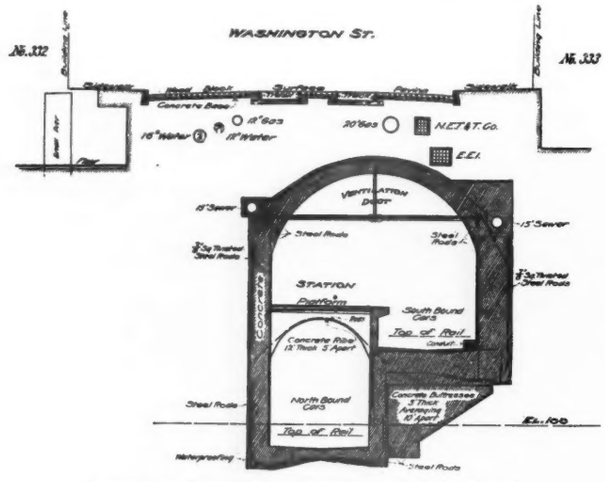
tunnel was built in sections 7 to 8 ft. long. The steel reinforcing rods from the arch and invert were carried into the hollow piers through openings formed by removing some of the slabs from the tunnel side of the wall, that face having been left unloaded until then. The piers were filled with concrete when placing the concrete for the invert and arch, thus securing the desired monolithic structure.

Almost all of the stairways and station entrances and exits are on what was hitherto private property, taken by the commission. They are of two general types. One of these, illustrated by the accompanying plan of the Temple place structure, consists of a broad stairway, unequally divided, serving both as entrance and exit. A landing, extending 6 ft. inward from the sidewalk, leads to a 15-ft. stairway descending about 8 ft. in one straight flight to a landing below the street floor of the building, usually a store. A half-turn, followed by a second straight flight, leads to the ticket lobby.

The other type provides, in each case, an entrance from Washington street and an exit—sometimes also an entrance—on an adjacent side street. The general features of this type are shown by plan of the Winter street station, in which the additional feature of a sub-passageway, connecting with the opposite Summer street station, is introduced. A similar connection is provided between the Boylston and Essex street stations.

The ventilation of the tunnel will be improved, as in the original subway and in the East Boston Tunnel, by admitting fresh air at the stations and portals and withdrawing the more or less contaminated air at intermediate points. The entrances and exits are fitted with Bostwick folding gates instead of doors, and metal grilles are placed over the discharge openings. Owing to the location of the tunnel, it is not generally practicable to secure free delivery at the points where the air leaves the tunnel and there are obvious objections to the use of sidewalk gratings for this purpose. To meet this difficulty, the escaping air will be carried to fan-chambers through specially constructed ducts with a cross-sectional area of about 40 sq. ft. These ducts are formed in some cases, as shown in the drawing, by a light plaster partition, on a wirework base, stretched between the tie-rods and separating the upper portion of the arch from the tunnel proper; in others, also shown, they are concrete masonry conduits below the invert. The maximum length, from inlet to fan-chamber, is about 430 ft.

Fan-chambers are provided at four points, with room in each for two single-inlet centrifugal fans, each with a capacity of at least 20,000 cu. ft. per minute. This will give an average velocity of air in the tunnel of over 1 ft. per second, equivalent to changing the air in each section three or more times per hour.

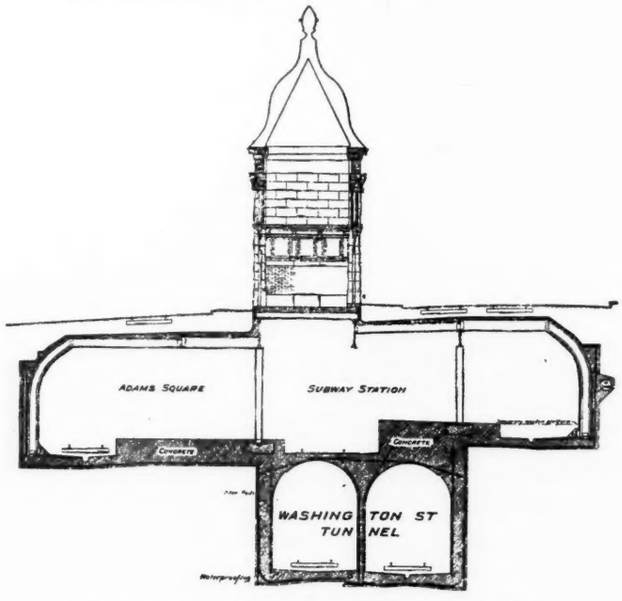


Cross Section 52 ft. South of Milk Street.

The desirability of protecting structural steelwork from the air has led to the encasing of girders, beams, columns and tie-rods in concrete, with finished surfaces due to the use of smooth and carefully fitted forms. This avoidance of plastering applies to the concrete generally, the specifications calling for surfaces, except where tile finish is to be applied, equal to plastered work. "This is not to be done, however, by plastering, but by the proper use of the best forms." Areas on which tiles are to be laid may have projections and deviations from a plane surface not exceeding ⅛ in.

The platforms are of concrete, with a 1-in. granolithic surface. Stairways are of similar construction, with Mason's patent carborundum-filled safety treads and nosings in all cases.

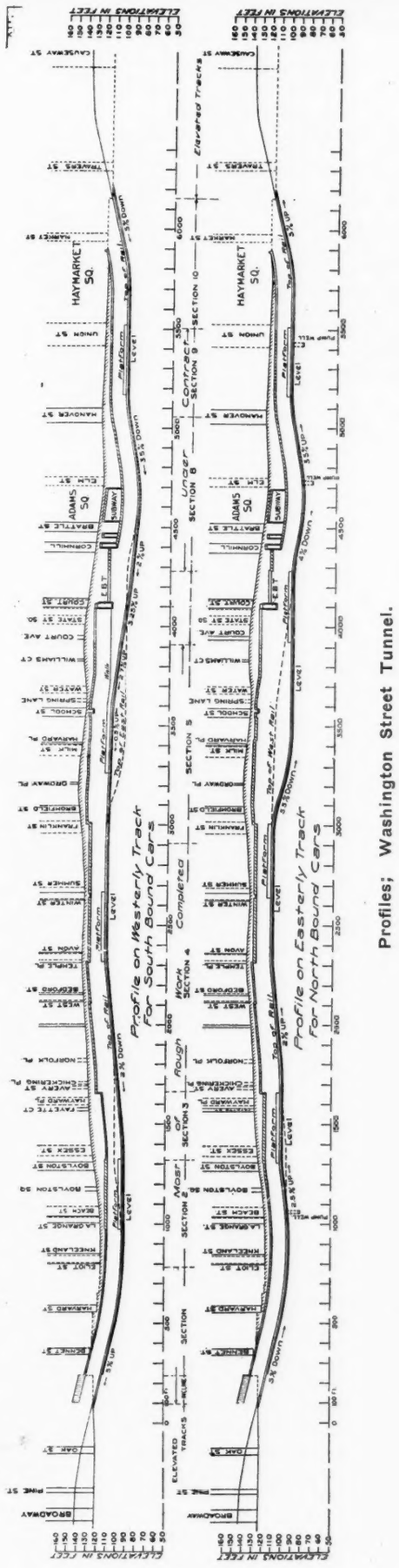
Partly owing to the staggering of the platforms an unusually large area of surface tiling is called for. The general idea has been to use 3-in. x 6-in. x ⅜-in. white enameled tiles for the lower 5 ft., with ¾-in. x ¾-in. x ¼-in. white ceramic tiles above and in coves and arches. The latter, in colors, are likewise employed for borders and station names and for the curved sanitary base adjoining the platform.



Cross Section Under Adams Square Station.

The original subway is leased to the Boston Elevated Railway on terms which contemplate the repayment of the entire cost of construction, including land purchase, easements and all incidental expenses, with interest, in about 40 years from the date of the lease. The same principle is incorporated in the act of 1902. Section 10 provides for a contract giving the company the sole and exclusive use of the Washington Street Tunnel and appurtenances for the period of 25 years from the beginning of such use, at an annual rental equal to 4½ per cent. of the net cost of the work. Such net cost is defined as embracing "all expenditures incurred in acquisition and construction, including damages, expenses and salaries of the Commission, and interest at 3¼ per cent. per annum on the debt incurred in construction prior to the beginning of the use."

The act of 1897, amended in this respect in 1906, authorizes the construction of a subway, in Boston, connecting the city of Cambridge with the original Boston subway. As at present contemplated, this connection will be effected by a tunnel about one-half mile long under Boston Common (see map), starting from the Park street station of the subway. The same starting point is designated, by an act of 1907, for the Riverbank subway, 1½ miles long, which will follow the easterly bank of the Charles river, west of Beacon street, after passing



under the Common and crossing under Charles street northerly of the Public Garden. This will afford a convenient connection with a large residential district, including Newton, Brighton and Watertown.

The legislature has taken a broad view of the functions to be fulfilled by the Transit Commission and has called upon it from time to time for advice in regard to the general problem of transit in the city. Thus, in compliance with a resolve of the year 1905, the Commission reported in January, 1906, as to the further development of the subway system and the most desirable routes; the necessity, or otherwise, of further subways and the possibility of their construction endangering the stability of existing structures. Again, in January of the present year the Commission reported upon a detailed investigation of the congestion and delay of teaming traffic and the movement of freight within the city, with special reference to whether such congestion and delay could be relieved by the construction of freight transfer subways.

Howard A. Carson, M. Am. Soc. C. E., has been Chief Engineer to the Commission since its formation in 1894.

ACCIDENT BULLETIN No. 28; YEAR TO JULY 1, 1908.

The Interstate Commerce Commission has issued Accident Bulletin No. 28, giving a summary in the usual form of the Railroad Accidents in the United States during the three months ending June 30, 1908. The number of persons killed in train accidents was 112, and of injured, 2,277. Accidents of other kinds bring the total number of casualties up to 13,689 (591 killed and 13,098 injured). These reports deal only with (*a*) passengers and (*b*) employees on duty.

TABLE No. 1.—*Casualties to Persons—April, May and June,* 1908.*

	Passengers		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	10	544	24	411	34	955
Derailments	3	644	67	409	70	1,053
Miscellaneous train accidents.†	0	25	8	244	8	269
Total train accidents	13	1,213	99	1,064	112	2,277
Coupling or uncoupling	..	..	30	549	30	549
Other work abt trains or switches	..	..	16	2,742	16	2,742
In contact with bridges, etc.	1	12	25	244	26	256
Falling from cars or engines or while getting on or off	30	684	127	2,058	157	2,742
Other causes	13	613	237	3,919	250	4,532
Total other than trn. accidents	44	1,309	435	9,512	479	10,821
Total all classes	57	2,522	534	10,576	591	13,098

*"Passengers" includes passengers traveling on freight trains and also postal clerks, express messengers, employees on Pullman cars, newsboys, live-stock tenders, and men in charge of freight.
†Including locomotive boiler explosions.

This bulletin covers the quarterly period ending with the *ninth* month of light freight traffic on most of the principal railroads. This depression, which diminished the number of freight trains run and caused the dismissal of many railroad employees, showed itself in some degree in Bulletin No. 26 (quarter ending December 31, 1907). Bulletin No. 27 showed gratifying reductions in the number of casualties in all of the different classes, the number of persons (passengers and employees) killed in train accidents being the smallest reported since the monthly records were established. In the present bulletin the improvement is carried still farther. The number of passengers killed in train accidents (13) is the smallest ever reported in the quarterly records, the lowest previous record (18) being that in Bulletin No. 4 (June 30, 1902). The total of passengers and employees killed in this class (112) is 13 less than the previous low record (125, Bulletin 27). The number of employees killed in coupling or uncoupling cars now reported (30) is smaller than in any other quarter, except that ending September 30, 1901 (Bulletin No. 1), when the number was exactly the same.

The following table (No. 1*a*) shows the usual comparisons with the last preceding quarterly bulletin and with one year back; and below it is a list showing the totals of passengers

and employees killed in train accidents, each quarter, since the monthly records were established:

Table No. 1A.—*Comparisons of Principal Items.*

	Bulletins		
	No. 28.	No. 27.	No. 24.
1. Passengers killed in train accidents	13	21	48
2. Passengers killed, all causes	57	72	111
3. Employees killed in train accidents	99	104	202
4. Employees killed in coupling	30	44	72
5. Employees killed, all causes	534	656	954
6. Total passengers and employees killed	591	728	1,065

Table No. 1B.—*Passengers and Employees Killed in Train Accidents.*

Bulletin.	Passengers.	Employees.	Total.	Bulletin.	Passengers.	Employees.	Total.
No. 28	13	99	112	No. 14	53	189	242
" 27	21	104	125	" 13	228	183	411
" 26	21	199	220	" 12	23	144	167
" 25	110	236	346	" 11	40	181	221
" 24	48	202	250	" 10	147	299	446
" 23	126	295	421	" 9	60	220	280
" 22	180	294	474	" 8	31	199	230
" 21	52	215	267	" 7	52	248	300
" 20	27	167	194	" 6	40	226	266
" 19	62	212	274	" 5	41	222	263
" 18	50	270	320	" 4	18	122	140
" 17	43	229	272	" 3	41	171	212
" 16	41	221	262	" 2	51	221	272
" 15	28	204	232	" 1	57	183	240

The total number of collisions and derailments in the quarter now under review was 2,130, as below:

Table No. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons—Killed.	Persons—Injured.
Collisions, rear	141	$109,044	5	155
" butting	98	194,757	18	442
" train separating	64	23,025	..	20
" miscellaneous	517	210,147	11	338
Total	820	$536,973	34	955
Derailments due to:				
Defects of roadway, etc.	274	$215,790	6	314
Defects of equipment	529	398,140	6	162
Negligence train & sign'l men, etc	61	22,395	2	52
Unforeseen obstruct'n track, etc.	120	224,999	30	202
Malicious obstruct'n track, etc.	19	23,851	6	64
Miscellaneous causes	307	195,250	20	259
Total	1,310	$1,080,425	70	1,053
Total collisions and derailments	2,130	$1,617,398	104	2,008

Following is the usual list of Class A train accidents—all in which the damage is reported at $10,000 or over; notable cases in which passengers are killed and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest:

Table No. 2A.—*Causes of Twenty Prominent Train Accidents (Class A).*

[Note.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

Collisions.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
1	R.	P. & F.	1	6	$1,085	1	Passenger train ran 9,044 ft. past automatic block signal (indicating stop) and at 40 miles an hour struck freight train moving at about 15 miles an hour. One passenger in the freight train was killed. The engineman at fault was experienced.
2	B.	P. & P.	1	29	2,300	21	Butting collision, special trains; engineman of excursion train disregarded stop signal at a registering station. Conductor applied air brakes, but too late.
3	B.	P. & F.	0	2	2,500	22	Eastbound freight and westbound passenger; 10:35 p.m.; telegraph wire being out of order, trainmaster (on freight train) attempted to modify despatcher's order, but his directions were thwarted by a mistake of an inexperienced operator who had been in service only that night. The engines of both trains were equipped with electric headlights, and one or both of the enginemen misjudged the distance between the trains.
4	M.	P. & F.	1	9	3,350	19	Engineman extra freight misread watch, making a mistake of 1 hour. Discovering that he was on the time of a special passenger train, he set back, but too late. The conductor of freight was dismissed for carelessness.
5	B.	P. & F.	0	0	4,000	43	Extra train was run without orders. (See note in text.)
6	B.	P. & F.	0	32	6,380	40	Engineman forgot order; error also in block signaling. (See note in text.)
7	B.	F. & F.	0	25	12,874	41	Conductor and engineman forgot or overlooked 1 of 3 orders which they held; met 1 train but failed to wait for another one, covered by another order.
8	B.	P. & P.	1	31	13,184	39	Operator neglected to deliver order to eastbound train. Had 4 orders, delivered only 3. Operator's experience, 6 years.
9	B.	P. & F.	2	54	20,845	20	Conductor and engineman of northbound freight encroached on time of southbound passenger. These men had leave to use 40 minutes of the time of the passenger train, but made a mistake in calculating from the timetable. They allowed themselves until 12:56 p.m. to reach a certain station, when, according to the order and the timetable, they should have been there at 11:56. These men were experienced.
10	B.	P. & P.	9	21	25,000	46	Of 9 persons killed, 7 were passengers. The cause was disregard of a despatcher's order. (See note in text.)
Total			15	209	$91,518		

Derailments.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
1	D.	P.	0	4	$400	55	Ran off derail at approach to drawbridge, 10 p.m. Signal light was extinguished, the filament of an electric lamp having been burned out. Engineman said he was deceived by a green light on the draw. This light, displayed for the benefit of boats in the river, turns with the draw, and the draw had not been opened.
2	D.	P.	0	0	635	54	Switch at power interlocking thrown while train was passing over it; movement of detector bar was forced in spite of presence of wheels of train.
3	B.	F.	0	0	2,000	8	Runaway of work train on descending grade, due to air brakes being inoperative. Laborers in getting aboard train stepped on angle cock, closing it.
4	D.	P.	2	4	2,500	29	Dynamite maliciously placed on track.
5	D.	P.	1	1	3,350	58	Washout; roadbed weakened by flood which had been diverted from mountain stream 200 ft. above the road by a fallen tree.
6	D.	F.	0	3	13,477	30	Arch, 9 ft. radius, beneath track, partly washed out by flood. Surface roadbed showed no indication of weakness.
7	D.	F.	2	1	20,550	9	Embankment washed away by flood, due to cloudburst.
8	D.	P.	3	61	25,000	56	Burned bridge, 6 p.m.; no blaze visible from approaching train.
9	D.	P.	0	7	56,600	17	Embankment 25 ft. high gave way. Cause apparently seepage which had been going on some time but had not been discovered. Track in good condition. Fire in wreck ignited gas from broken tank, and all but 1 of the cars of the train were destroyed.
10	D.	F.	0	0	10,900	35	Broken flange, derailed cars destroyed a bridge.
Total			8	81	$135,412		
Grand total.			23	290	$226,930		

Collision No. 5 was due to the attempt of a conductor and an engineman to run on a foreign line without train orders; they meant to protect their train by flag, but failed to do so. These men, running a train of the A & B road, were to run over the X & Y, on account of the track of their own line being impassable. When leaving a registering station on the X & Y they did so without authority, making no communication with the telegraph operator; they neither registered nor asked for a clearance card and they had no train order. They sent a flagman ahead, but their instructions to him were not in writing and he did not get to the proper point to stop the approaching train. He should have stopped at a certain switch, but instead of doing this he went to the telegraph office and the passenger train, with which his train subsequently

collided, left the station before he could convey to the engineman the order to wait.

Collision No. 6 was caused by the engineman of a passenger train forgetting a despatcher's order, requiring him to wait at a certain station for an opposing freight train. He put this order in his pocket while oiling his locomotive, and forgot it. The conductor, who should have read the order aloud in the presence of the engineman, neglected to do so. The block system, more or less modified, was in use on the line and the passenger train should have been held at the entrance of the block section in which the collision occurred, but the signalman gave it a clear signal, "thinking that the train was to run to the far end of the siding, there to wait for the opposing train." All of the men concerned are reported as experienced.

Collision No. 10, a butting collision of electric cars, was due to the violation of a despatcher's order by the conductor and motorman of one of the cars, which was running "extra." The stations on the line where the collision occurred are A, C, B, and N. The regular car was running from N to A. About the time that it left N the extra car was ready to start from A to the new part of the order below the obliterated line. The conductor claims that the operator informed both himself and the motorman that they "had a clear track to B." This statement is denied by the operator. For such a movement as this the conductor had no authority to accept other than a written order from the operator. The motorman, who was injured in the collision, left for parts unknown while still under the doctor's care, and no statement was obtained from him.

This motorman, 33 years old, had been in the service of the company about six weeks, but is said to have been employed on single-track interurban railroads for the past eight years. The officers of the road regarded him as one of the best of their motormen. The conductor had been in the service of the company six weeks, but had been in the employ of other electric companies; kind of service not stated. The operator is reported as having a clear record.

YEARLY TABLES.

This bulletin completes the publication of the accident records under the law of March 3, 1901, for seven years, and the table next following, Table A, gives the aggregates for

TABLE A.—SUMMARY OF CASUALTIES TO PERSONS, YEAR ENDING JUNE 30, 1908.

[NOTE.—The italic letters refer to the corresponding totals for the last preceding year, printed below.]

		Passengers (*a* and *b*)		Persons carried under agreement, etc. (*bb*)		Total, (*a*, *b* and *bb*)		Trainmen.		Trainmen in yards.		Yard trainmen (switching crews)		Other employees.		Total employees.		Total all persons.	
		Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.
a	Collisions	102	3,903	9	381	111	4,284	191	1,832	42	690	31	422	39	484	303	3,428	414	7,712
b	Derailments	46	2,671	8	380	54	3,057	203	1,412	16	168	26	234	15	251	260	2,065	314	5,122
c	Mis. train accidents.*	0	75	0	14	0	89	59	894	6	226	6	129	8	76	79	1,325	79	1,410
d	Total train accidents	148	6,655	17	775	165	7,430	453	4,138	64	1,084	63	785	62	811	642	6,818	807	14,248
e	Coupling or uncoupling	...	.....	..	.....	..	.....	71	959	45	642	114	1,435	9	85	239	3,121	239	3,121
f	While doing other work about trains or while attending switches	...	.....	..	...	..	...	61	7,790	40	2,700	48	2,986	57	2,515	206	15,991	206	15,991
g	Coming in contact with overhead bridges, structures at side of track, &c	3	29	1	8	4	37	71	681	12	276	13	345	14	51	110	1,353	114	1,390
h	Falling from cars, or engines or getting on or off	154	2,434	5	67	159	2,501	281	4,607	98	2,356	152	3,376	137	1,396	668	11,735	827	14,236
i	Other causes	69	2,440	9	237	78	2,677	160	831	103	438	106	443	1,124	15,614	1,493	17,326	1,571	20,003
j	Tot'l other accidents	226	4,903	15	312	241	5,215	644	14,868	298	6,412	433	8,585	1,341	19,661	2,716	49,526	2,957	54,741
k	Total all classes	374	11,558	82	1,087	406	12,645	1,097	19,006	362	7,496	496	9,370	1,403	20,472	3,358	56,344	3,764	68,989
	Statistics for the Year Ending June 30, 1907.																		
a		193	4,227	16	506	209	4,733	364	2,702	73	850	48	504	82	752	567	4,808	776	9,541
b		159	3,718	26	466	185	4,184	259	1,786	22	218	18	232	31	275	330	2,511	515	6,695
c		15	134	1	19	16	153	84	1,052	4	266	13	160	13	127	114	1,605	130	1,758
d		367	8,079	43	991	410	9,070	707	5.540	99	1,334	79	896	126	1,154	1,011	8,924	1,421	17,994
e		...	.....	..	...	...	.....	88	1,130	57	718	135	1,985	22	115	302	3,948	302	3,948
f		...	.....	..	...	...	.....	91	8,430	45	3,012	69	3,182	105	3,087	310	17,711	310	17,711
g		7	31	1	13	8	44	93	797	13	288	23	445	5	61	134	1,591	142	1,635
h		146	2,044	16	69	162	2,113	319	5,077	120	2,466	206	3,525	145	1,497	790	12,565	952	14,678
i		50	2,096	17	274	67	2,370	209	780	125	372	118	453	1,354	16,345	1,806	17,950	1,873	20,320
j		203	4,171	34	356	237	4,527	800	16,214	360	6,856	551	9,590	1,631	21,105	3,342	53,765	3,579	58,292
k		570	12,250	77	1,347	647	13,597	1,507	21,754	459	8,190	630	10,486	1,757	22,259	4,353	62,689	5,000	76,286

*Including locomotive boiler explosions.

N, and the despatcher (sending train orders by telephone) dictated an order for both trains, directing that the extra meet the regular train at B. Finding that it was too late to deliver the order to the regular train, he instructed the operator at A to change it. As originally sent it read: "Car 2 will run extra A to N and meet train 3 at B." He ordered it changed to read: "* * * will run extra A to N and report at B."

The authority to run as an extra train, when given in this unqualified form, means that the extra must keep clear of the schedules of all regular trains in either direction, and therefore (in this case) must keep off the time of No. 2. This movement could have been made, as there were two places at which the extra could have cleared the regular trains before reaching the point at which it would encroach on the regular train's schedule; but the men in charge of the extra car proceeded toward B, apparently without considering the schedule of the regular train, and collided with it near C.

The operator at A, when ordered to change the train order, did not destroy the one that he had written, but simply drew his pen through the words "and will meet 3 at B," and wrote

the year ending June 30, 1908, of the items which are given in Table No. 1 of the quarterly returns. The total number of casualties shown for the year in Table A is 72,753 (3,764 killed and 68,989 injured).

This table includes statistics which did not appear in the quarterly bulletins, the reports from which they are taken having been received after the bulletins were printed.

The totals of these yearly tables are not comparable with those given in the commission's annual statistical reports, for the reason that the monthly reports deal only with accidents to passengers and to employees while on duty.

The salient facts of the records of casualties for the year are shown in Table B. From this it will be seen that the number of passengers killed in train accidents is much less than half as large as it was in the year before; and it is only a little over half the average for the preceding three years (1905-1907). The total of passengers and employees killed in train accidents equals only 63 per cent. of the previous record. The number of fatal coupling accidents (239) is 20 per cent. less than last year.

From Table B, next following, comparisons may be made for the last three years:

TABLE B.—*Casualties to Passengers and Employees.*

	Year ending June 30, 1908. Killed.	1908. Injured.	1907. Killed.	1907. Injured.	1906. Killed.	1906. Injured.
Passengers:						
In train accidents	165	7,430	410	9,070	182	6,778
Other causes	241	5,215	237	4,527	236	4,407
Total	406	12,645	647	13,597	418	11,185
Employees:						
In train accidents	642	6,818	1,011	8,924	879	7,483
In coupling accidents	239	3,121	302	3,948	311	3,503
Overhead obstructions, etc.	110	1,353	134	1,591	132	1,497
Falling from cars, etc.	668	11,735	790	12,565	713	11,253
Other causes	1,699	33,317	2,116	35,661	1,772	31,788
Total	3,358	56,344	4,353	62,689	3,807	55,524
Total both classes	3,764	68,989	5,000	76,286	4,225	66,709

The following tables are self-explanatory, being consolidations of the quarterly tables giving the same classes of facts:

TABLE C.—*Collisions and Derailments, Damage to Cars, Engines, and Roadway, Years Ending June 30.*

	1908. No.	1908. Loss.	1907. No.	1907. Loss.
Collisions, rear	1,397	$1,298,044	1,957	$2,003,509
" butting	795	1,473,618	1,065	1,935,505
" train separating	436	165,850	695	259,495
" miscellaneous	3,735	1,697,687	4,309	2,101,059
Total	6,363	$4,635,199	8,026	$6,299,568
Derailments due to:				
Defects or roadway, etc.	1,426	$1,088,261	1,528	$1,255,114
Defects of equipment	2,796	2,176,194	3,178	2,490,028
Negligence train & signl men,&c	406	273,038	495	396,626
Unforeseen obst'n of track etc.	381	562,441	387	556,725
Malicious obst'n of track etc.	90	144,903	59	153,694
Miscellaneous causes	1,572	1,303,624	1,785	1,713,947
Total	6,671	$5,548,461	7,432	$6,556,134
Total collisions & derailments	13,034	$10,183,660	15,458	$12,685,702

ASSOCIATION OF CAR LIGHTING ENGINEERS.

The first convention of the Association of Car Lighting Engineers was held at the Grand Pacific Hotel, Chicago, commencing November 16. The proceedings of the first day were occupied largely by matters of business and papers relating to the history of car lighting, which included the following: "The History of Railway Electric Train Lighting," committee report, by Patrick Kennedy, Morris Moskowitz and William F. Bauer; "A History of Axle Lighting," by W. L. Bliss, and a paper on "Railway Train Lighting," by A. H. Bauer.

On Tuesday a large part of the day was occupied in discussing the report of the committee on the "Care and Maintenance of Storage Batteries," F. R. Frost, chairman. This report considered the subject under two heads; first, lead-lined tanks, and, second, rubber jar tanks. In the discussion on lead-lined tanks the general belief was that wood could not have been treated in any way which would prevent it from being attacked by the highly concentrated acid from the batteries and its consequent rapid deterioration.

The report of the committee on "Straight Electric Lighting" reached the conclusion that axle generators and steam turbines have been developed to such a point that with competent inspection they will give satisfactory service, and if the proper system of electric lighting is installed to meet the demands of the service no system of auxiliary lighting is now required and is only an unnecessary expense.

On Tuesday afternoon the Association was addressed briefly by W. E. Symons and by A. H. Darker, representing J. Stone & Co., of England. Mr. Darker stated that this company has equipped 30,000 cars with axle lighting and that their system is used in all European countries; also, that no auxiliary lighting was used with any of the cars so equipped.

On Wednesday the report on "Illumination and Distribution of Lights in Cars" was presented. It contained a full account of experiments in the illumination of cars, made on the Lake Shore road. In the discussion of the subject the use of the Cooper-Hewitt mercury vapor lamps for lighting mail cars was described, and the results of tests made by the Rock Island Road were reported. Mail cars on this line, lighted with Cooper-Hewitt lamps, have been in operation more than 18 months and the experiment has proved to be quite successful. The car is lighted by three type H mercury vapor lamps of 20-in. tube length, operating in multiple on axle system at 55 volts and 3½ amperes. The illumination is very much more brilliant than that obtained from Pintsch gas or the incandescent lamps. The average foot-candles of the mercury vapor lamp is 8.85; of Pintsch gas 1.32, and of incandescent lamps, 2.21. The foot-candles per watt per square foot are 7.69 for the mercury vapor lamps, and 1.7 for the incandescent lamps.

The report of the committee on "Head End Electric Lighting of Passenger Trains," C. R. Gilman, chairman, assumed that the principal operation by the head end system would be by turbine dynamos, and gave an estimate of the cost of equipping a railway having 900 passenger cars and operating over 7,500 miles of track. With this type of car lighting the total cost of the investment was $577,000 and the operating expense per year $441,174. The average cost per car per year was $490, and the cost per car per day $1.34. In this estimate depreciation and repairs to batteries were figured at 15 per cent. of the initial cost. It is interesting to see in this estimate that the cost of fuel consumed in hauling the lighting equipment is $114,500, or about two-thirds as much as that required for the operation of the dynamo.

An elaborate report on "Electric Lamps for Cars" was presented by a committee, J. J. Hack, chairman. This committee found that it was advisable to work in co-operation with the Lamp Manufacturers' Association, and the report includes some valuable data obtained from that association. It is notable that the Tungsten and Tantalum lamps are making rapid progress in adaptability to car lighting. The Tungsten lamps at present available for train lighting have a voltage range from 20 to 32, the watts per candle 1¼ and a life of 800 hours. Tests on these lamps for car use have been very satisfactory, and the indications are that they may be used as a substitute for carbon lamps, sufficient data having been obtained to show that any faults developed can be easily overcome. The Tantalum lamps are made with voltage from 25 to 65, candle power from 5 to 23, each using 2 watts per candle power, and the life is given as 800 hours.

The relative cost of different lamps is given as follows: Per 100 hours service, including power and lamps at 5 cents per kilowatt hour; 16 candle power carbon lamp, 38 cents; 12 candle power Tantalum lamp, 18.9 cents; 24 candle power Tungsten lamp, 25 cents. The Manufacturers' Committee submitted the following suggestions: First, that the voltage of the different systems should be reduced to one or two standards, with a range from 25 to 32 volts for low standard and from 55 to 62 volts normal as a high volt standard. Second, that a standard lamp be fixed, having a voltage of 25 to 32, lamps being connected in series on the high voltage range. Third, that all special lamps be abandoned with the exception of berth lamps and perhaps two other types.

On Thursday morning Chester Terry, of the St. Paul, Minneapolis & Sault Ste. Marie, read a report on "Axle Lighting," giving the detailed cost of operation on a number of roads. The average cost of operating 80 cars on one line was $26.33 per car per month and per 1,00 car miles, $3.46. The report was quite favorable to this system, and said that electric car lighting in all forms was not properly cared for, that proper facilities were not provided at terminals and that the batteries especially were often neglected. On motion of W. L. Bliss a committee was appointed to confer with the Master Car Builders' Association with a view to recommending a standard for axles and the location of pulley for axle lighting.

On Thursday the closing business session was held, and the president, A. J. Farrelly, of the Chicago & North-Western, and secretary and treasurer, G. B. Colegrove, of the Illinois Central, were re-elected for the ensuing year. The next meeting of the Association will be held in Chicago October 5 to 8, 1909.

HANDLING OILS ON THE SANTA FE.

During the latter part of 1905, the storekeeper's department of the Atchison, Topeka & Santa Fe found it necessary to perfect a system of handling and accounting for materials and supplies. In order to do this it was necessary to improve facilities at all important terminals, especially with regard to store and oil-houses. After a most satisfactory test it was decided to use the long-distance self-measuring oil pumps made by S. F. Bowser & Co., Inc., Ft. Wayne, Ind. One feature of particular merit in this system is the fact that the old-fashioned oil-house is not necessary, as the storage tanks are placed in the basement and pipes run to the oil pumps in one corner of the storehouse proper, as seen in the illustration of the storehouse at Shopton, Iowa. By this plan it is possible to do away with the first cost of oil-house building, also the necessity of having extra attendants, which latter has been necessary since the oil and the storehouse are usually placed some distance apart. The Bowser system permits of the storehouse attendant taking charge of the oils, and in the case of the Santa Fe this has amounted to reducing the expense for special oil-house men of each point from $120 to $100 per month.

Santa Fe Storehouse at Shopton, Iowa.
Showing long-distance pumps.

In the Santa Fe system the storage tanks are placed in a concrete basement under the material platform, which is some distance from the storehouse proper. Filler pipes run from the storage tanks to a point underneath the platform, convenient to the receiving track, and the storage tanks are filled direct from tank cars. Filler pipes are placed in the floor of the storeroom or on the material platform, level with the surface, so that the small storage tanks in the basement, containing boiled oil, turpentine, varnish, etc., may be filled from barrels or drums. This filling operation is done without any waste and at a minimum in the cost of labor.

The most important feature in connection with the Santa Fe system is the method employed to draw the oil from the storage tanks with the long-distance self-measuring pumps. It is possible to draw or lift the heaviest oils a distance of from 100 ft. to 1,000 ft. The pumps measure gallons, half gallons, quarts or pints. A discharge register tallies the amount of oil drawn. This device registers from one to ten gallons and then repeats, making a record of the amount of oil pumped at each operation. A gallon meter, registering as high as 5,000 gals., makes a continuous record, enabling one to keep an accurate account of all oil drawn. Each pump is equipped with a special locking device which locks the pump when not in use. Oil can be drawn or the pumps operated only by those persons authorized to do so by being supplied with keys.

Another feature of this system which should appeal to railroad officers is the absolute safety from fire. It is claimed that insurance companies, fire boards and building inspectors recommend this system on account of the small fire risk. The pump discharges only that amount of oil which is required. The Santa Fe has decreased its oil bills by eliminating former wastes in oil. The time saved in handling oil over the counter in the storeroom is also to be considered. One storehouse clerk can fill an order for both material and oil at the same time.

The oil house at Shopton is one of the first plants where this system was installed on the Santa Fe. The accompanying cuts show the cleanliness and economy of space which this system permits. There are now 16 similar plants on this railroad, handling practically all oils in tank cars, thereby doing away to a great extent with the necessity of handling or distributing oil in barrels. This represents one of the economical storehouse systems instituted on the Santa Fe by N. M. Rice, General Storekeeper, to whom we are indebted for the information and illustrations.

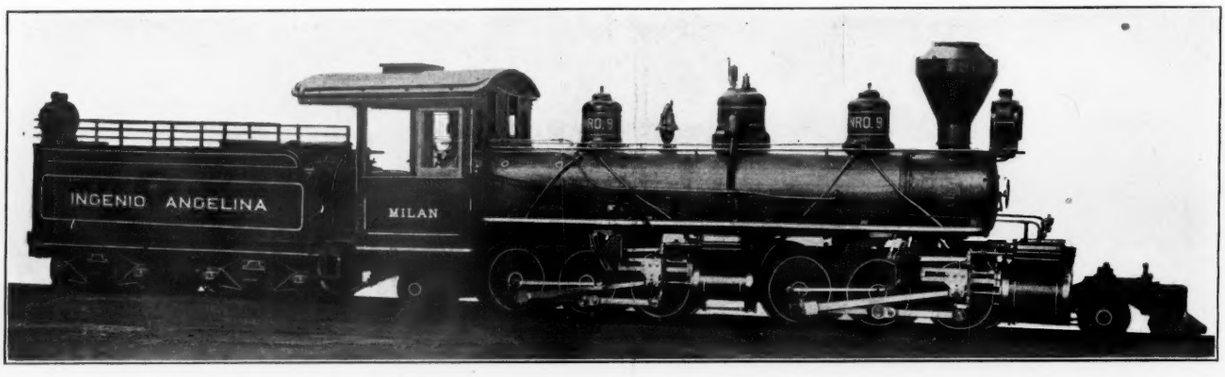
Basement of Shopton Storehouse.
Showing oil storage tanks with piping to pumps.

The "second track" of the Siberian Railroad amounts on many parts of the line west of Irkutsk, known as the "East-

ern Siberian," to the building of a new railroad, reducing grades and curves and shortening the line, being just what a great many American railroads have been doing when the traffic grew to be heavy enough to justify the expenditure. The first section of the road, as far as Achinsk, is in a plain country, and not much revision of the line is needed; but from Achinsk to Irkutsk, 680 miles, in an undulating country, there is much heavy work, now nearing completion. Some 3,000 men have been at work on it, about one-third of them convicts.

MALLET ARTICULATED COMPOUND LOCOMOTIVES FOR SANTO DOMINGO.

Most of the Mallet articulated locomotives thus far built in this country have been of standard gage, suitable for the heaviest class of road and pushing service. In consideration of this fact, a locomotive of the Mallet articulated type, recently completed by the Baldwin Locomotive Works for a narrow gage line in Santo Domingo, is of special interest. This locomotive will be employed on the Angelina plantation. The track gage is 2 ft. 6 in., the line being laid with 25-lb. rails and has curves of 175-ft. radius. The tractive force exerted by the engine is 11,630 lbs., which is high, considering the limiting conditions.

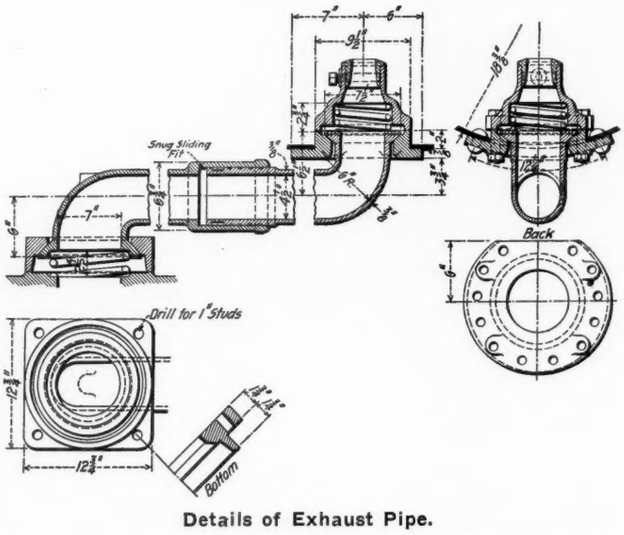


Baldwin Mallet Compound for Santo Domingo.

The 2-6-6-2 wheel arrangement is that applied to the majority of Baldwin Mallet locomotives previously built. The leading truck is center-bearing and is equalized with the front group of driving-wheels, while the trailing truck is side-bearing and is equalized with the rear group. The frames are of cast steel, both front and back being continuous throughout their entire lengths. The frame joint is placed between the high pressure cylinders, and the connection is double, radius bars being bolted to both upper and lower rails of the front frames. The joint is also provided with the usual equalizing bolts, which are seated in the upper rails of the front frames and the lower rails of the rear frames. The high-pressure cylinders are cast separately from the saddle, and are securely bolted between the upper and lower rails of the rear frames. The saddle itself is cast steel, made in two pieces, placed one above the other. The receiver pipe, 4½ in. in diameter, is provided with a ball joint at the back end and a slip joint, with packed gland, near the front end. The low pressure cylinder castings are bolted together back to back. The exhaust pipe leading to the smoke box, shown in the accompanying cut, is made in two sections, and is ball-jointed at each end. Coiled springs are employed to hold the ends of the pipe against their respective seats. At the smokebox end the pipe is seated in a casting, which is bolted to the smokebox shell, and is surmounted by a low single exhaust nozzle. The slip joint in the middle of the pipe is made tight by water grooves and cast-iron snap rings. All four cylinders are equipped with balanced slide valves, actuated by the Walschaerts motion. The reverse shafts for the high and low pressure gears are connected by a single reach-rod placed on the center line of the locomotive. This reach-rod passes through a slot in the high-pressure cylinder saddle, and is provided with a knuckle joint immediately in front of the articulated frame connection. With this arrangement, distortion in the movement of the low-pressure valves when the engine is curving, is reduced to a minimum.

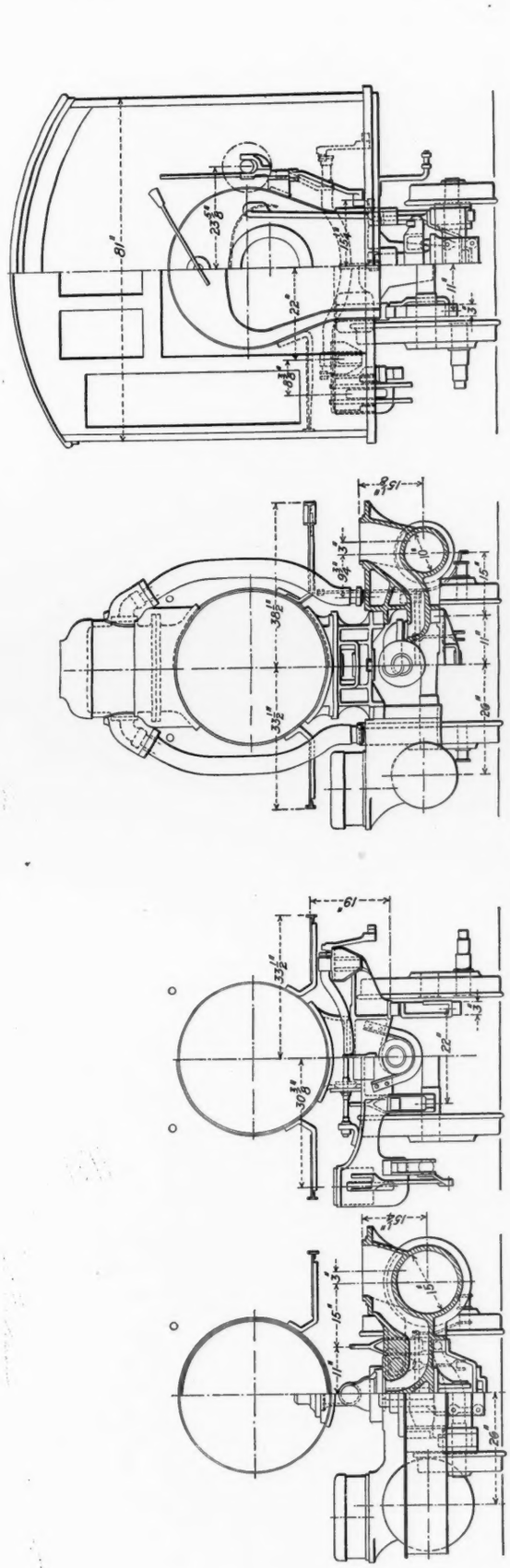
Reversing is effected by the usual lever and also by a hand-wheel and screw, either of which may be used. The valve motions are so connected that the high-pressure radius rods are up in forward gear and the low pressure down. The high and low-pressure link bearings are mounted on their respective guide yokes. The low-pressure reverse shaft bearings are bolted to extensions of the waist bearer which supports the front end of the boiler barrel. A spring centering device, for the forward group of wheels, is placed under the smoke-box.

The boiler is straight topped, with three rings in the barrel. Inside liners are provided under the high-pressure cylinder saddle and waist bearers. The firebox, radially stayed, is placed above the frames. The grate is composed of plain bars and dead plates, suitable for wood burning, and the smokebox is short, with a petticoat pipe and Radley and Hunter stack. The dome is cast steel, made in two sections. The throttle valve is balanced and the throttle box provided with side connections which are seated in short pipes cast integral with the dome body. The high-pressure steam pipes are rolled steel tubing.

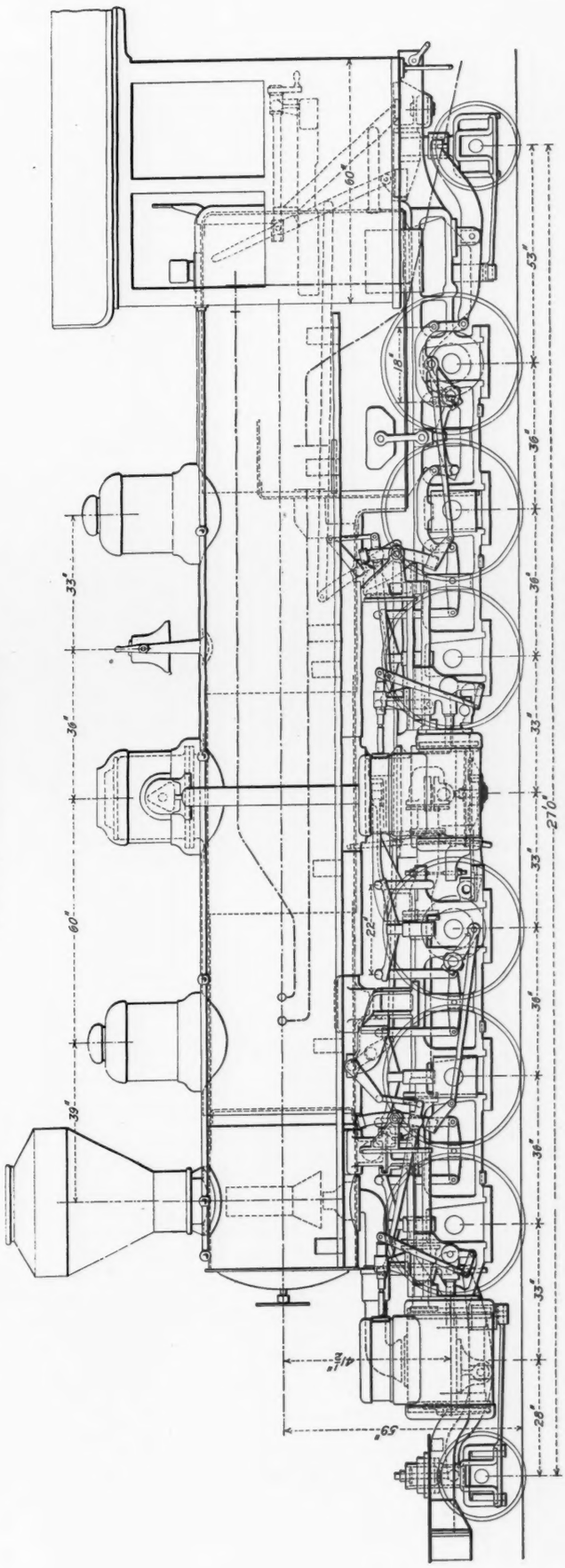


Details of Exhaust Pipe.

The boiler is fed by two injectors, placed right and left; also by a duplex feed pump, which is placed on the left-hand running board immediately in front of the cab. Steam-brake equipment is fitted to the driving and tender wheels. The



Cross Sections and Elevations.



General Elevation; Baldwin Mallet Compound for Santo Domingo.

tender has a capacity for 1,200 gals. of water and 1½ cords of wood. The trucks are of the arch-bar type, and the frame is built of 6-in. channels. A wood rack is provided around the top of the tank. This design is interesting, as an example of a relatively powerful locomotive with flexible wheel base and minimum axle loads. The following are some of the principal dimensions of these engines:

Cylinder diameters	10 in. and 15 in.
Piston stroke	16 "
Boiler, diameter	36 "
Boiler, thickness of sheets	⅜ "
Steam pressure	180 lbs.
Firebox, length	67¼ in.
" width	20⅛ "
" depth, front	36½ "
" depth, back	35 "
" thickness, sides and back	5/16 "
" " crown	⅜ "
" " tubesheet	7/16 "
" water space, front	3 "
" water space, sides and back	2 "
Tubes, material	Iron
" thickness	No. 12
" number	88
" diameter	1¾ in.
" length	12 ft. 6 "
Heating surface, firebox	49 sq. ft.
" " tubes	501 "
" " total	550 "
Grate area	9.4 "
Wheels, diameter, driving	33 in.
" " trucks	20 "
" " tender	24 "
Journals, driving	4½ in. x 6 in.
" truck	3½ " x 6 "
" tender	2¾ " x 5 "
Wheel base, driving	17 ft. 6 in.
" total engine	27 " 0 "
" engine and tender	43 " 9½ "
Weight on drivers	51,900 lbs.
" " truck, front	4,550 "
" " truck, back	3,750 "
" total	60,200 "
" engine and tender, about	85,000 "
Tank capacity, water	1,200 gals.
Tank capacity, wood	1½ cords
Tractive effort	11,630 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.46$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 5.17$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 86.21*$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 697.80$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 58.51$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 8.98*$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 94.36$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 109.45$$

$$\text{Displacement 2 h. p. cylinders, cu. ft.} = 1.45$$

$$\frac{\text{Heating surface}}{\text{Displacement, 2 cylinders}} = 379.71$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 cylinders}} = 6.48$$

* Per cent.

Among the victims of the accident on the Berlin Elevated Railroad, September 26, by which 16 were killed and 20 severely wounded, was Dr. Else Rosenthal, a daughter of Dr. Alfred von der Lezen, a high officer in the Prussian Ministry of Public Works, who has visited this country and published two volumes on our railroads, and to whom Americans in search of information concerning German railroads have often been indebted. The girl had been married but a year. She was a practising physician, the granddaughter of the Friedrich Kapp, who for years was a refugee in this country and wrote the lives of the German officers engaged in the American Revolution. The victim's mother was one of the early graduates of Vassar College.

AMERICAN RAILWAY ASSOCIATION.

A partial report of the Fall meeting of the American Railway Association at Chicago on November 18 was published in the *Railroad Age Gazette* of November 20, page 1410. The following refers to proceedings of the meeting which were not covered in that report:

The rules for the transportation of explosives as formulated by the committee on that subject in connection with the regulations as prescribed by the Interstate Commerce Commission, were approved, as were also the regulations for the transportation of inflammable articles and acids. The former remain substantially as published in the *Railroad Gazette* November 7, 1907.

The report of the Committee on standard location for third rail working conductors covered the investigation made by that Committee as to what recommendations should be made at the present time in the location of conductors other than those of the third rail type. The Committee stated that it could only offer at this time a progress report because the newer systems are undergoing rapid evolution and therefore limitations at this time might injuriously affect the proper adaptation of the system.

On recommendation of the Committee on Car Efficiency the association amended the standing resolution covering interchange reports to read as follows:

Resolved, That the interchange report be made in quadruplicate, signed by the proper representative of the delivering road and certified by the proper representative of the receiving road after thorough checking, the original with one copy to be returned to the delivering road, to the end that each local representative and each car record office may have identical copies of the same report.

On recommendation of the Committee on Car Service the association voted to eliminate paragraph A of rule 9 of the Code of Car Demurrage Rules, and to make the following addition to rule 2:

In addition to the free time allowed above, free time will be allowed equal to any time lost directly by reason of weather interference of such severity as to damage the freight in handling it into or from the car; but no additional time shall be allowed for weather interference after the expiration of 48 hours of working weather—this to include cases where shipments are frozen so as to prevent or seriously hinder unloading.

On the recommendation of the Committee the elimination of the note to rule 11 of the Code of Per Diem Rules was ordered submitted for a vote by letter ballot. The note in question reads as follows:

This paragraph will not apply to statements bearing on amounts accruing prior to July 1, 1905.

The amendment to rule 15 of the Code of Per Diem Rules, as proposed by the Committee, was also ordered submitted to the members of the association for a vote by letter ballot. The rule, as it is proposed to amend it, would read as follows, the italics indicating the changes and addition it is proposed to make:

15. When a road gives notice to a connection that for any reason it cannot accept cars in any specified traffic, thereby instituting an embargo, it should receive cars already loaded with such traffic *on the date* such notice is issued, and cars loaded within 24 hours thereafter. If it does not receive such cars the road holding them may reclaim per diem from the road placing the embargo for the number of days such cars are held not exceeding the duration of the embargo.

Twenty-four hours after the date of the notice a road must not load or reconsign cars in such traffic to the road issuing the notice.

Embargo notices must be sent by the embargoing road to its direct connection and by it transmitted as may be necessary. They must be sent or transmitted by and to a designated transportation officer by wire, with reference number, and confirmed by letter the same date. They must give the reason why the embargo is placed, and state whether cars in transit will be accepted.. When transmitted, they must include the name of the road first placing the embargo, with date of issue.

The association adopted the following, on the recommendation of the Committee on Car Service, to be made a standing resolution:

The average miles per car per day will be computed as follows:

(*a*) *Freight Car Mileage*: 1. The mileage should include the loaded

and empty miles made by all freight cars (exclusive of caboose cars) handled in freight and mixed trains. 2. The mileage should be computed from the conductor's train reports.

(*b*) *Freight Car Days*: 1. An inventory should be taken from the records on Wednesday of each week, which must include every freight car (exclusive of caboose cars and cars permanently assigned to maintenance-of-way service) for which an interchange record or other tangible evidence of delivery to a connecting line cannot be produced. Divide the aggregate number of cars obtained from these inventories by the number of inventories taken, the result being the average daily number of cars on line.

2. Multiply the average thus obtained by the number of calendar days in the month, the result being the total car days for the month. This figure may be corrected by an actual count of car days from the record.

(*c*) *Miles Per Car Day*: Divide the freight car mileage by the freight car days, the result being the average miles per car per day.

NOTE.—All computations under these rules should be separated as between home and foreign cars.

The Committee on Car Service was authorized to reconcile, as far as practicable, the views of the Master Car Builders' Association and the Association of Transportation and Car Accounting Officers, on the subject of freight car making and to make a report thereon.

Daniel Willard (C., B. & Q.) was re-elected First Vice-President of the association.

The following were elected members of the Committee on Car Service: Chicago & Western Indiana, Lake Shore & Michigan Southern, Wabash.

The following were elected members of the Committee on Safety appliances: Chesapeake & Ohio, Lehigh Valley, Pennsylvania Lines West of Pittsburgh.

The following were elected members of the Committee on Nominations: A. H. Smith, vice-president and general manager New York Central & Hudson River, and J. C. Stuart, general manager Erie.

The Committee on Safety Appliances announced that G. L. Peck, general manager Pennsylvania Lines West of Pittsburgh, had resigned as a member of the Committee and that R. E. McCarty, General Superintendent Southwestern System Pennsylvania Lines West, had been elected to fill the vacancy.

The executive committee announced that it had appointed a special committee on relations with the Interstate Commerce Commission as follows: F. A. Delano (Wabash), W. C. Brown (New York Central), Jno. P. Green (Pennsylvania), Daniel Willard (C., B. & Q.), Robt. Mather (Rock Island).

Adopting the recommendation of a special committee on carding cars, the association adopted the following resolutions:

Resolved, That the only cards that shall be permitted on cars shall be as follows: Routing Cards. To be of cardboard; maximum size, vertical dimension 5 in., horizontal dimension 8 in. To be permitted on all loaded cars.

No pictures or trade mark to be permitted. Space for railway information, to occupy lower three-fifths of card. Any printing on the upper two-fifths to be limited to letters not exceeding one-half inch in any dimension. All printing to be in black ink. Any deviation from the above will be considered as an advertisement and cards should be removed as per M. C. B. Rule 41. They may be affixed by shippers, not to exceed one card on each side of a car; must not be pasted or glued but placed in rack or on specified location when such is provided for in local rules.

Special Placards.—These shall be such as are required by the regulations for the transportation of explosives formulated by the Interstate Commerce Commission and the regulations for the transportation of inflammable articles and acids prescribed by the American Railway Association, and are to be of the size as therein described. They shall be used, be of the text and be attached to the cars as prescribed by said regulations.

Symbol and M. C. B. Cards.—These are prescribed by individual roads for special purposes. Their size, use, text and method of application will be prescribed by each individual road to suit its requirements.

Special Card Required by Federal or State Governments Custom Regulations.—This is a card printed on red cardboard 8 in. by 10½ in. in size, which specifies the penalty for the unlawful removal of the United States customs seals, and will be used as prescribed by the United States customs regulations.

Other cards required by the laws of the United States, and within some of the states.

LOCATION OF CONDUCTORS OTHER THAN THIRD RAIL.*

On March 23, 1908, your committee presented a report with resolutions governing standards, and the report as a whole was subsequently adopted by the association as recommended practice. It has been suggested that the subject should be further considered in a somewhat wider scope than indicated in the title, to cover not only the location of a third rail proper, but to include electrical working conductors generally, in order to embrace conductors suitable for the various systems proposed for electric propulsion. Your committee, therefore, has considered as to what recommendations could be made at the present time in the location of conductors other than those of the third rail type.

A "third rail," as laid down in the definition adopted by the association, is "an electrical conductor placed adjacent to and parallel with the track rail as a means for conducting electric current to the locomotive or cars." A conductor so placed is suitable only for an electric system employing a low potential current, say of 500 to 600 volts. Other electric systems are now in process of development using a higher potential current, in some cases up to many thousands of volts, and thus necessitating placing the conductors out of reach of the public or employees on the right of way.

As in the case of a third rail, it is important to establish at the earliest practicable date standards for the position of such a conductor, to best fit the electrical requirements and the running conditions and limitations, and to facilitate interchange between various roads. Your committee has carefully considered the questions involved and can offer at this time a progress report only, for the reason that these newer systems are undergoing rapid evolution, and therefore limitations imposed at this time might injuriously affect the proper adaptation of the systems.

Generally speaking, the requirements are:

To establish an overhead conductor at sufficient height to safely clear a man standing on top of a box car under normal conditions and at the same time to introduce approach slopes in the overhead conductor so that its height can be reduced when passing under overhead bridges and maintain a minimum safe equipment clearance.

That the overhead conductor should be located in such a position relative to the running track that continuous contact with the conductor can be maintained by a sliding shoe on the car under all conditions of limitations between the maximum and minimum heights and through switches, turnouts, etc.

That the height so established shall allow a certain minimum clearance between the overhead conductor and overhead construction to provide for proper insulation, and, in the case of overhead bridges, to provide for the attachment of insulators between the overhead conductor and the bridge.

In order to meet all conditions, it appears to be desirable that the overhead conductor should be located over the center line of the track served, rather than at one side of same, although it has been suggested that to distribute wear on the sliding shoe, the conductor shall be at intervals displaced from the central position, producing a sinuous direction with a certain maximum displacement on either side of the central line.

It is necessary, furthermore, to establish certain standards

* Report of the Committee on Standard Location for Third Rail Working Conductors, American Railway Association, Chicago, Nov. 18, 1908.

in relation to the sliding shoe and its supporting mechanism, to establish the proper pressure to exert at the point of contact; the range of vertical motion to be allowed for, and the maximum length of the shoe transverse to the track; this latter to permit side clearance between the extreme positions of the shoe and signal blades and other overhead apparatus or structures.

In regard to the above requirements, as before stated, it seems inadvisable to fix at present definite limitations because of the incompleteness of our information and experience as to best running conditions, but the following figures are being used experimentally in the development of the overhead conductor system:

	500 to 2,000 volts.		2,000 to 11,000 volts.	
	Ft.	In.	Ft.	In.
Normal height of overhead conductor above top of rail	22	00	22	00
Minimum height of overhead conductor above top of rail	15	01	16	00
Minimum clearance between overhead conductor and overhead bridges	00	04½	00	10
Minimum clearance between overhead conductor and highest point of train equipment passing under same not less than	00	03	00	12
Maximum length of contact shoe transverse to track	5	04	5	04

Maximum rate of incline in overhead conductor approaching and leaving low points, 2 ft. in 100 ft.

Proper transition curves should be provided at all vertical intersections in the overhead conductor.

The figures given above do not include installations in submarine tunnels, where special insulation and construction will modify the minimum clearances as compared with normal indications.

It must be understood that the figures given are not in any way intended to be regarded as standards, even of a tentative nature. They are, as above noted, merely statements of practices now in vogue, and are given for the purpose of eliciting criticism and suggestions.

TRANSPORTATION OF EXPLOSIVES.*

The Bureau for the Safe Transportation of Explosives and Other Dangerous Articles has been in successful operation during the past six months, and now has eighteen inspectors in the field.

As the members of the association are well aware, the laws relating to the transportation of explosives, which have been upon the United States statute books for many years, were exceedingly crude and impossible of enforcement. Under date of May 30, 1908, a new law on this subject was passed by Congress. As provided under the terms of this law, regulations for the transportation of explosives were formulated by the Interstate Commerce Commission, to take effect October 15, 1908.

At the request of the commissioners your committee appeared before them at Washington on June 29, 1908, and a full conference was held with regard to the subject matter of these regulations. As a result, the Interstate Commerce Commission's regulations were based upon the rules previously adopted by the American Railway Association, but they placed the duty of compliance directly upon the carriers, instead of upon certain employees. It, therefore, became the duty of your committee to compile the rules as adopted by this association in a new form. This has been done with little or no change from the principles embodied in the rules adopted by the association on April 22, 1908, and copious references are made therein to the official regulations promulgated by the Interstate Commerce Commission.

Regulations for the transportation of inflammables have been formulated to take effect also on October 15, 1908. These regulations are practicaily in the form approved by you at the meeting on April 22. A few slight changes, mostly in form, have, however, been found advisable, and the regulations as thus revised are recommended to the association for adoption.

The resolutions unanimously adopted at the last meeting of the association, requesting the Honorable Secretary of War to permit Col. B. W. Dunn to remain in his position of Chief Inspector of the Bureau of Explosives until at least July 1, 1909, have been responded to by the extension of his detail until February 1, 1909.

A new method of assessment has been adopted by the Bureau of Explosives in connection with its necessary expenses. Article VI., Section 1, of the constitution of the Bureau has been changed to read as follows:

Section 1. The executive committee shall have the power, and it shall be its duty, to make assessments semi-annually upon members of the bureau to cover any expenses already incurred, or thereafter to be incurred, which, in the opinion of the committee should be borne by this bureau.

The amount to be assessed shall be apportioned among and based upon the following items:

1. Magazines used for the storage of explosives from which shipments are made by rail.

2. Manufactories of explosives from which shipments are made by rail.

3. Gross earnings.

4. Per mile of road operated.

The amount to be assessed for each magazine shall be at the rate of six dollars per annum.

The manufactories of explosives shall be rated by the chief inspector of the bureau of explosives in proportion to their maximum capacity and divided into four classes upon which the amount of the assessment shall be based respectively at the rates of $25, $50, $75 and $100 per annum.

Whatever part of the total assessment shall not be raised by the charges based upon magazines and manufactories shall be levied upon the basis of gross earnings for the year ending on the previous June 30, and upon the miles of road operated at the date of the assessment, one-half upon the gross earnings and one-half on the miles operated.

A magazine or manufactory shall be considered as being upon a road when explosives are delivered from it for shipment at one of the stations of the road, either by full carload or less than carload shipments.

If a magazine or manufactory is located on a switching road and cars are delivered to another road by switching arrangement, there being no participation in the freight charges by the switching road, the magazine or manufactory shall be considered as being located on the road which bills the freight and not on the switching road.

The term "manufactory of explosives" includes all factories where the explosives, designated in paragraph 1668 of the Interstate Commerce Commission Regulations, dated July 15, 1908, are manufactured, and the charges based upon magazines and manufactories shall be made in accordance with the records of the bureau at the time the assessment is made.

Unless otherwise previously arranged, the part of the assessment based upon a magazine or manufactory will be apportioned equally among the several roads members of the bureau upon which it is located, when it ships by more than one road.

The new section was adopted at a meeting of the members of the Bureau, called for that purpose, held in New York city on September 30, 1908, which was quite largely attended. As a result of the debate at that meeting it was made evident that the new method adopted will distribute the expenses of the Bureau among the members on a much better basis than the former method, and the plan now adopted is believed to be the fairest that can be devised.

COMMITTEE ON CAR EFFICIENCY.

The Committee on Car Efficiency of the American Railway Association at the Fall meeting of the Association in Chicago, Nov. 18, reported that after the panic, when railways were hurrying the return of each other's cars and when many roads were returning foreign cars empty and loading their own cars away from home, the percentage of loaded mileage dropped to 61.4 per cent., as compared with 72.9 per cent. in October, 1907. The Committee said that when its bulletins covering car surpluses showed that the enormous number of 400,000 cars were standing idle, some exception was taken to its reports, but the prompt and steady reduction of the surpluses which were reported as trade picked up had proved

* Extracts from the report of the Committee on Transportation of Explosives, American Railway Association, Chicago, Nov. 18, 1908.

encouraging and had confirmed the Committee's confidence in the general accuracy of its reports.

As a result of the empty movement of cars, the roads are now enjoying in general the use of 78 per cent. of their own cars as against 54 per cent. in April, 1907; but the Committee thought it extremely doubtful whether this result justified the immense amount of empty mileage involved, which appeared to have exceeded 525,000,000 miles in the month of January alone.

In Exhibit A the Committee said:

"There is little doubt that the regular appearance of these reports (of surpluses) acted as a warning that cars would be less plentiful and thus stimulated the resumption of business. Had the reports been such as to foster a hope of immunity from the usual Fall car shortage, or if the public had not been advised of the decreases in the surplus, it is quite probable that considerable business that should ordinarily move in September and October would have been held off until November and December, resulting in possible congestion and the consequent shortage of equipment which almost invariably follows such a condition.

"The general adjustment in car balance, which was one result of the lessened demands for cars, brought about a condition under which nearly all roads found themselves in possession of cars equivalent to approximately 100 per cent. of their total ownership. As a consequence of this situation there will probably be little necessity for any intervention to bring about equalization between roads until the resumption of business again results in a wide scattering of equipment.

"The appearance, however, during September and October of shortages in particular classes of cars in certain sections of the country, resulted in calls on the Committee for assistance in supplying the shortages from the stock of surplus cars on neighboring lines.

"During the last period of shortage it was found that the work of distribution was greatly aided by the publication of detailed reports showing surpluses and shortages by individual roads.

"These reports were discontinued while there was a large surplus, but now that conditions are approaching normal it is the intention to resume them for circulation among the members of the Association as soon as such action seems necessary.

"Under normal conditions very interesting comparisons could be made between April and May figures for 1907 and 1908. Unfortunately, however, the unusual conditions prevailing since November, 1907, so affected the averages as to render the comparisons of less value than they would otherwise be.

"This is especially true of those averages which result from the application of the total number of cars to the performance of only a portion of the cars such averages varying in proportion to the number of idle cars.

"Among these averages are the 'Miles per Car per Day,' 'Ton Miles per Car per Day' and 'Daily Earnings per Car.'

In the introductions to our various monthly bulletins we have given approximate figures covering the performance of cars actually in service, such averages being obtained by the elimination of surplus available and excess bad order cars. The following is a summary of the adjusted averages, compared with those which include cars temporarily non-productive:

	Average miles per day.		Average ton-miles per car per day		Average earnings per car per day.	
	Inc. surp. cars.	Exc. surp. cars.	Inc. surp. cars.	Exc. surp. cars.	Inc. surp. cars.	Exc. surp. cars.
December, 1907	21.9	23.9	289	316	$1.98	$2.17
January, 1908	20.8	24.9	277	325	1.81	2.17
February, 1908	19.7	23.8	271	328	1.82	2.20
March, 1908	21.2	25.5	290	348	1.95	2.34
April, 1908	19.6	24.5	258	324	1.83	2.29
May, 1908	19.3	24.8	254	329	1.72	2.22

"It will be noted that the change in conditions did not materially affect the daily mileage of the cars actually in use.

"The increased proportion of empty mileage, however, reduced the productivity of the car movement, the results appearing in the decreased 'Ton Miles per Car per Day' and 'Average Earnings per Car per Day.'

"Although the averages above referred to require adjustment before they are satisfactory for comparative purposes, the 'Car Balance,' percentages, 'Per Cent. of Cars in Shop,' and 'Per Cent. of Loaded Mileage' may be used without adjustment as direct measures of performance and efficiency.

"The 'Per Cent. of Loaded Mileage,' quite graphically reflects the results brought about by the car surplus and the desire of the railways to rid themselves of foreign cars, the possession of which constituted a drain on their revenues. From the high figure of 72.9 per cent. reached in October, 1907, when the roads were enjoying an unprecedented traffic, the loaded mileage dropped to 70.2 per cent. 64.6 per cent. and 61.4 per cent. in November, December and January, respectively.

"February reports show a reaction to 66.5 per cent., which continued through March and April, while a further slight increase to 67.5 per cent. appears in May, 1908.

"The reduced demand for cars also had its effect on the number of cars held out of service account of bad order. The October and November percentages of shop cars (5.55 per cent. and 5.27 per cent., respectively), gradually increased until in May, 1908, the figure reached 8.98 per cent.

"The car balance percentages provide information showing the disposition of the freight car equipment of the country.

"In April, 1907, the railways reporting had on their lines only 54 per cent. of their own equipment, this being the lowest percentage of which we have any record since the year 1903, the earliest period for which there are any general car balance statistics.

"Taken by groups, the percentage of cars at home ranges from 32 per cent. in Group 7 (Montana, Wyoming and Nebraska) to 63 per cent. in Group 1 (New England).

"As the latter group had a total equipment on line equaling 164 per cent. of the number owned, the proportion of home cars to foreign is actually much lower in this group than in the general average.

"The lines in Group 2 (Eastern), which are reported as owning about one-third of all cars, had but 56 per cent. of their cars at home, while the roads in Group 3 (Middle) held only 49 per cent. of their own cars.

"With the lessening demand for equipment, the tendency was toward a return of cars to their owners, and by August the per cent. of cars at home had increased to 62 per cent., the same average which appears in the report for the first six months of 1906. (See A. R. A. Circular 755-B). That the percentage was no higher during a month of light business than during a period which may be fairly considered as normal (notwithstanding the fact that the per diem rate was 50 cents during August, 1907, as against a rate of only 20 cents during the first half of 1906), indicates rather plainly that the common use of cars is being quite rapidly extended.

With the Fall revival in traffic, the per cent. of cars at home again shows a reduction, dropping to 60 per cent. in September and 58 per cent. in October, when the scattering of equipment was suddenly halted by the general business depression. In November, 1907, the number of cars returned to their owners exactly offset the number loaded off their home lines, while in December the returns exceeded the outward movement to such an extent as to increase the per cent. of cars at home to 64 per cent. From December this increase was continuous until April, 1908, when the figure reached 78 per cent., a total change of 20 points since November, 1907. The percentage for May was the same as for April.

"Some of the group figures show still more remarkable changes. The roads in Group 3 (Middle), which held but 49 per cent. of their cars during October, 1907, had this percentage increased to 85 per cent. in May, 1908. Group 9 (Southwestern) increased from 41 per cent. in November, 1907, to 66 per cent. in May, 1908, and Group 2 (Eastern) from 56 per

cent. in November to 75 per cent. in May. Group 1 (New England), while bringing about a net reduction in its total cars on line from 131 per cent. in November to 108 per cent. in May, shows an increase in its own cars at home from 58 per cent. to 78 per cent., plainly indicating a considerable cross movement of empty cars.

"The general adjustment of balance was in itself distinctly beneficial, exemplifying as it does a partial application of the recognized principle of the Association that 'each railway should be assured at all times the use of a number of cars equivalent to the number it owns.'

"It is certainly to the advantage of the originating road to be placed in possession of equipment approximating 100 per cent. of its ownership.

"It is also advantageous to the distributing road to be relieved of its accumulated excess. Generally speaking, however, the measure of the advantage is in the number of cars concerned, rather than in the ownership of the cars. It is extremely doubtful whether the benefits derived by any road or roads from the possession of their own particular cars are great enough to offset the expense involved in the equalization, especially when it is considered that the condition is at best but temporary and that a complete resumption of business will undoubtedly be followed by as wide a distribution of equipment as prevailed during the months immediately preceding the recent depression.

"However desirable the end arrived at may have been, the means by which it was accomplished seem hardly justified, particularly at a time when there was such urgent need for the exercise of the most rigid economy in railway operation. Although the condition itself was brought about by influences beyond the control of the railways, it was not beyond their power to prevent a considerable proportion of the enormous empty mileage resulting from the cross haul of equipment concerned in the adjustment of balance.

"Even allowing for the proportion of cross movement made necessary by the variation in direction of traffic and classes of cars, there still remains a large amount of empty mileage which could have been prevented by a system of equalization by net balances, regardless of the ownership of individual cars, or by reciprocal arrangements between roads for storing surplus equipment wherever located.

"It is the constant complaint of car owners that the rules heretofore in effect have not availed to prevent the extension of the common use of cars, and the car balance statistics would seem to provide ample verification of this claim, but it is doubtful whether rules which will overcome this natural tendency are possible of adoption or enforcement under the present system of through freight transportation. Indeed, it is hardly probable that any such rules, if adopted, would prevail against the regulations governing interstate commerce, with which they might conflict.

"While there is probably no immediate prospect of a duplication of the situation existing during the past year, it is probable that there will always be recurring periods of car surplus, and it is only by the general recognition of the condition with which we are confronted, and the adoption of methods in harmony with that condition, that a repetition, at least in part, of the recent wasteful performance may be prevented."

The committee said in the course of its report:

"The Committee's work on the line of interchange reports has been continued. The importance of this work has been recently accentuated by the various plans which have been evolved for settling per diem accounts on the basis of a daily balance. These plans promise much in the way both of efficiency and economy, but for their successful carrying out a decided improvement in the accuracy of the interchange reports is essential.

"The best plan for securing accuracy in interchange reports that the Committee has found is in effect at Denver, and much of the Committee's work in this connection has been in the line of explaining the advantages of the Denver Plan to roads in other parts of the country.*

"Investigation of methods of recording and reporting interchanges has brought out the fact that in many places the interchange clerks and the freight car inspectors are doing duplicate work in the way of recording the numbers of the cars interchanged. The chance for economy was so obvious that your Committee consulted the Master Car Builders' Association on this matter, through its Executive Committee, its Arbitration Committee and its Secretary. As a result, the Committee is collecting the interchange agreements in effect at all points, and is in position to inform any point as to the arrangements in effect at others.

"The attention of the Committee has also been directed toward inspection arrangements, through the delay to many cars by back switching when the receiving line refuses to repair. This "set-back" movement of interchange cars occurs so frequently, in the case of cars with defects in safety appliances, that the Committee has made a special investigation of this subject, which involved consultation with the Interstate Commerce Commission.

"It has been the custom at a large majority of interchange points, for the receiving road to absolutely refuse to repair any defects in safety appliances, even if these defects could be repaired on interchange tracks without movement of the car; indeed, it has been the general impression that the law demanded the refusal of such cars, even if such refusal resulted in the movement of cars for considerable distances to the shops of the delivering road. This, of course, was an error and has been corrected at a number of points—notably at Kansas City and Minneapolis; but it is believed that no general explanation of the matter had been given until the 15th of this month, when the Secretary of the Commission handed to your Chairman the letter, with enclosures, which is printed in Exhibit C-5. From this we quote:

" 'Nine-tenths of the repairs to safety appliances can well be made without any movement whatever. It is not understood that the law has anything to do with the formal delivering of a car from one road to another, but is confined entirely to the use and hauling of the car. The Commission and its inspectors have nothing to do with where repairs are made.' [Since this report was prepared a change in the Interstate Commerce Commission's rules regarding repairs to defective safety appliances has been made. The amended rule was published by the *Railroad Age Gazette*, November 13, page 1359.]

"The work of the Clearing House has been chiefly that of clearing per diem and mileage balances between railroads and individual car owners. There are now 16 railroads clearing their balances in this way. The balances cleared are about $30,000 per month and are on the increase. The expense of the Clearing House to each road, so far, has been less than the amount of postage saved. It is hoped that more roads will soon join in this undertaking. The work is done at cost to subscribers.

"The election of Mr. Delano to the Presidency of the Association left a place vacant in the Committee, which was filled by the election of H. I. Miller, President of the Chicago & Eastern Illinois."

Until within a few years ago nearly all passenger trains on the Prussian railroads had at least one first-class car, although on many trains there was rarely a first-class passenger, and on many not enough to pay for hauling the car. In fact, although of course on some through routes the first-class traffic has doubtless been profitable, it is shrewdly suspected that the first-class travel as a whole has netted loss. Recently many trains have had no first-class accommodations, and the winter time-table for 1908 shows that it has been dropped from a very large number of trains, on one group of lines alone from no less than 79. The second-class accommodations are quite good enough for anybody.

* See *Railroad Age Gazette*, August 7, 1908, page 658.

FLAT SPOTS ON CAR WHEELS.*†

BY CHAS. H. BENJAMIN,
Dean of the Schools of Engineering and Director of the Engineering Laboratory, Purdue University, Lafayette, Ind.

The damaging effect of flat wheels upon rails has long been acknowledged and measures have been taken to reduce the evil. Thirty years ago, the M. C. B. Association called attention to this matter and adopted a rule limiting the allowable length of flat spots to 2½ in. The recent agitation in regard to the failures of steel rails in service has led to renewed interest in this subject on the part of railroad officers. A proposition to reduce the allowable length of spot to 1¾ in. was the subject of a report made by the Committee on Iron and Steel Structures of the A. R. E. and M. W. Association at their last annual meeting. (See report of Mr. A. J. Himes, p. 297 of the Proceedings.) The matter is now in the hands of a joint committee of the M. C. B. and M. of W. Associations.

When the rule for the length of flat spots was adopted in 1878, the maximum freight car capacity was 40,000 lbs. and the weight of car 22,000 lbs., making a total weight on the wheels of 62,000 lbs. To-day the 100,000-lb. car when loaded to its maximum capacity will weigh nearly if not quite 150,000 lbs. The speed has even more influence than the weight since the energy of impact will vary directly as the weight and as the square of the velocity. Probably the average speed of freight trains has doubled in the last 30 years. It is, of course, true that the weight of rails has greatly increased in the same time. Although the new rail may be twice as strong as the old to resist bending between the ties, it does not follow that its capacity for resisting blows is increased in the same ratio. The damage done by the hammer blow of the flat wheel is liable to be of a local nature and may not be averted by the great depth and weight of rail. The violence of the blow is also increased by rigidity of the rail and its supporting ties and ballast. This is particularly true at high speeds.

Professor E. L. Hancock, of Purdue University, in a paper read before the Indiana Engineering Society at their meeting in January, 1908, developed a mathematical formula (see *Railway Age*, February 21, 1908) for the energy of impact of a flat wheel and reference is here made to that paper for an analysis of the problem. It is sufficient for my purpose to call attention to the following facts:

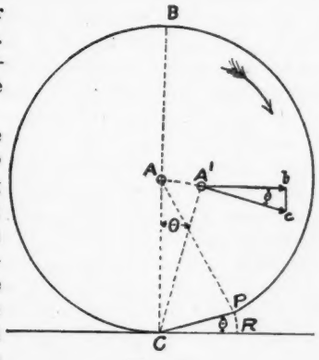


Fig. 1.

Let A in Fig. 1 be the center of a car wheel D inches in diameter, revolving as shown by the arrow, and C P be a flat spot L inches long just beginning its contact with the rail. The whole wheel is turning about the point C and will so turn until P reaches R and the blow is struck on the rail. At this latter instant, A will have reached A′ and will be moving downward with a velocity represented by the line b c. (The angle b A′ c = A C A′ = P C R = θ.) If the velocity of A′ which is practically the same as that of the train, is assumed as v feet per second, then,

$$b\,c = v \sin\theta = v\,\frac{C\,P}{C\,B} = v\,\frac{L}{D}$$

If we regard the mass of the wheel and its load as concentrated at A and call the total weight W pounds, the kinetic energy of the mass just before the rail is struck will be:

$$E = \frac{W\,v^2}{2\,g} \cdot \frac{L^2}{D^2} \quad \ldots\ldots\ldots\ldots (1)$$

Four facts are shown by this formula. The energy of impact will vary *directly* as:

1. The weight of wheel and its load.
2. The square of the velocity.
3. The square of the length of flat,

and *inversely* as:

4. The square of wheel diameter.

It is impossible to determine the force of the blow as this depends so largely upon the amount that the rail springs and gives under the impact. All we can do is to compare the energy of impact with that of the standard drop test for rails.

According to the specifications approved September 1, 1907,

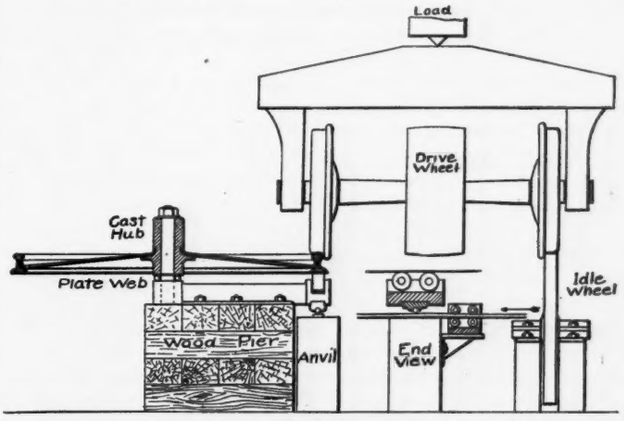


Fig. 2.

by the American Society for Testing Materials, the standard drop test for steel rails shall be made with a weight of 2,000 lbs. falling the distances indicated in the following table. The distance between the rail supports is to be three feet:

W't of rail, lbs. per yd.	Height of drop.	Kinetic energy in ft. lbs.	W't of rail, lbs. per yd.	Height of drop.	Kinetic energy in ft.-lbs.
45 to 55	15 ft.	30,000	75 to 85	18 ft.	36,000
55 " 65	16 "	32,000	85 " 100	19 "	38,000
65 " 75	17 "	34,000			

If we assume:

$$D = 33 \text{ in.},\ L = 2.5 \text{ in.},\ g = 32.2 \text{ lbs.}$$

and substitute these values in Equation (1), we have,

$$E = \frac{W\,v^2}{11{,}200} \quad \ldots\ldots\ldots\ldots (2)$$

If S = speed of train in miles per hour $= \frac{15\,v}{22}$ and

$$E = \frac{W\,S^2}{3220} \quad \ldots\ldots\ldots\ldots (3)$$

The following are some of the values of E for different weights and speeds:

Energy of Impact in Ft.-Pounds of a 2.5-in. Flat Spot on a 33-in. Wheel.

		Speed of train, miles per hr.			
		30.	40.	50.	60.
Weight on wheel	10,000 lbs.	1,725	3,060	4,790	6,900
	15,000 "	2,587	4,590	7,185	10,350
	20,000 "	3,450	6,120	9,580	13,800

If we compare these figures with those given under rail specifications, we find a factor of safety on a 100-lb. rail varying from 22 at the smallest weight and speed to 2.75 for the largest. If a 50-lb. rail is considered, the factor varies from 17.4 to 2.17. Since the impact varies as the square of the length of spot, reducing this length from 2.5 to 1.75 in. would diminish the impact about one-half and double the above factors of safety.

In the foregoing brief mathematical treatment, some factors have been neglected such as the impact due to the falling of the center of the wheel before the contact of the flat spot with the rail, the fact that the wheel is a compound pendulum and that the mass cannot be regarded as concentrated at its center of gravity, and the possible bounding of the wheel from one corner of the flat to the other without touching the rail at high speeds. It is not probable that any of these will have much effect on the values just given. It is, how-

*Paper presented at meeting of Western Railway Club, November 17, 1908.

†See *Railroad Gazette*, April 17, 1908, page 529.

ever, true that the flat spot on a wheel is usually not straight, but is convex or perhaps slightly rounded at the ends. For these reasons, it is extremely desirable from both a scientific and business point of view to determine experimentally the exact effect of the blow delivered by a flat wheel on the rail. It is hardly practicable to do this with a car on a straight track because of the influence of the driving wheels of the engine and the number of wheels which would pass over a given point. To be satisfactory, experiments should be confined to one wheel whose condition is determined beforehand.

The apparatus shown in Fig. 2 will permit of continuous operation of one wheel upon one section of rail indefinitely and permit at the same time of measurement of the effects of the blows. The truck is so supported that one wheel turns freely upon an idle pulley while the other wheel on the same axle rests on a section of steel rail and in turning drives the latter by friction. The section of rail is bent to a circle lying in a horizontal plane and is firmly riveted or bolted to a supporting web, which in turn is fastened to a central hub of cast-iron or steel. This hub turns freely on a vertical mandrel and is supported by a thrust bearing underneath. The rail and its attachments thus turn in a horizontal plane under the rotating car wheel. The portion of the rail immediately under the wheel is supported by friction rollers, which turn freely in a steel box or yoke. This latter forms a portion of the main casting supporting the hub of the rail and this casting is bolted to a wooden pier so as to have a certain amount of elasticity. On the lower side of this casting and directly beneath the point of contact between wheel and rail is a hardened steel hammer or ball resting on a strip of soft metal. The soft metal is supported on a heavy anvil of cast-iron and is fed slowly underneath the hammer by friction rollers. The truck being loaded with the desired amount of pig iron or other material, the wheels and their axles are rotated by means of a variable speed motor, and the energy of the blow delivered by a flat spot on the wheel is measured by the indentation of the strip of soft metal underneath the hammer. The amount of energy due to any given indentation can be readily measured by producing a similar indentation under a drop press. The curving of the rail in a horizontal direction is not sufficient to interfere with the action of the wheel and the energy of the blow is transmitted directly to the soft metal.

It may be noted that it is possible with this machine to drive the wheels at any desired speed corresponding to any desired number of miles per hour and that any length or shape of flat spot can be readily tested. It is also possible to change the load as desired.

The same apparatus can be used for determining the impact due to flat spots on locomotive drivers or the effect of the various types of counterbalancing on the rail.

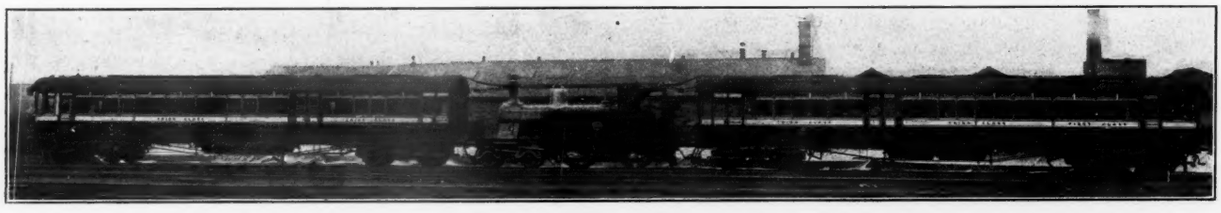
Such an apparatus can be arranged in a pit so as to bring the rail tested at grade and make it possible to run any truck or engine into position for testing without disturbing the mechanism of the truck itself, except as it may be necessary to attach a driving wheel. The results derived from the experiments can be combined with the mathematical reasoning in such a way as to make a working formula for practical use.

A simple modification of this apparatus would make it possible to test a span of rail between two supports the same distance apart as are the ties, and to measure the deflection produced by impact. It would also be possible to run a rail for any desired length of time under severe conditions and determine its wear and depreciation under these circumstances.

In view of the fact that there is at the present time some discrepancy between the rules for flat wheels and the speed and weight of trains, and to the further fact that no one seems to know exactly how much damage is done by flat wheels, it would seem very desirable to make an accurate experimental determination of the forces involved. The figures obtained from such experiments would also have a bearing upon the design of steel structures for railway use. The prominent part already taken by railway men in the experimental determination of the strength of railway machinery and structures would lead one to believe that this important investigation will not be much longer delayed.

MOTOR TRAINS ON THE TAFF VALE.

The Taff Vale Railway, England, consists of a number of branch lines and so lends itself particularly to the application of a motor car system. Conditions are such that full advantage may be, and has been, taken of the opportunity afforded for taking care of a large proportion of the passenger traffic by this means. It has been economical and otherwise entirely satisfactory. The number of passengers carried in the course of a year in the 13 cars possessed by the company averages about two millions, while 1,170 miles per day are covered by the motors in 200 separate journeys, 6,425 passengers being conveyed during that time. It was found necessary to provide special trailer coaches which might be attached to the motor cars at times of extra stress. A stage has now been reached in the operation of the motor traffic when it is necessary to provide even greater facilities, and with this purpose in view some short "motor trains" are being introduced, consisting of two eight-wheeled corridor cars, propelled by a small tank engine between them, as shown in the accompanying photograph.



Motor Train; Taff Vale Railway.

The tank engine is of the early Taff Vale Railway standard type, with four-coupled driving wheels and a leading bogie. The cylinders are outside the frames, and measure 16 in. diameter by 24-in. stroke; taking 80 per cent. of the boiler pressure, which is 140 lb. per square inch, a tractive force of 14,155 lb. is developed.

Each of the corridor coaches is 64 ft. long and weighs, empty, 31 tons. The length of the train over all is 162 ft. 5½ in., and accommodation is provided for 16 first-class passengers and 102 third-class. There is seating accommodation in smoking compartments for 48 passengers. The driver stands in a compartment at the extreme end of the car which at the time is in front, according to the direction of travel. An electric gong communicates with the cab of the engine for signalling to the fireman.

The trains are being placed in service on the Cardiff and Penarth and Cadoxton sections of the line, thus serving the principal residential towns in the neighborhood of Cardiff. They will also run between Pontypridd and Aberthaw, another essentially passenger and light traffic branch.

General News Section.

In the state Supreme Court at New York City, November 20, the indictment for manslaughter against the New York Central & Hudson River Railroad Company, in connection with the derailment at Williamsbridge, in February, 1907, was dismissed.

Experience with "pay-as-you-enter" cars in Chicago shows that not only do they secure fares which are ordinarily lost to the company, but also reduce the number of fatal accidents; and by over sixteen per cent. The number of less serious accidents due to getting on and off the car also is smaller.

The Railroad Commission of Washington on November 23 began final hearings to determine the value of the railway properties in the state and to apportion the valuation for state and interstate purposes. The Commission stated that it would remain in session until it had disposed of the entire matter.

The Alabama State Railroad Commission has cited the Pullman Company to show cause why it should not revise its rates in the state. The citation grows out of a new tariff presented a few weeks ago without consulting the commission, and which is said to be in the main an increase over the old tariff.

A committee of prominent negroes of Oklahoma has filed with the State Corporation Commission a suit against every railway in the state demanding dining and sleeping cars for colored as well as white travelers. The petition also asks that white passengers be prohibited from passing through the "Jim Crow" coaches.

Insurance Commissioner Barry, of Michigan, has discovered a brand new form of insurance among railway conductors. It is a "job" insurance scheme by which every man who loses his position through any cause except drunkenness or garnishee of salary is to receive $500. The next legislature will be asked to pass a law regulating and controlling this form of insurance, as rivals are already in the field.

A delegation representing the Federation of Women's Clubs asks the New York State Public Service Commission in New York city to order the use of destination signs on the front of trains in the subway; also that each car shall carry a list, conspicuously displayed, (inside the cars) of all stations at which the train stops, the local stations to be shown in black letters and the express stations in red. Some of the London "tubes" have such lists of stations in the cars.

At Ottawa, Ill., Nov. 20, the Appellate Court affirmed the decision of the lower courts in the case of the $100,000 judgment secured against the city of Chicago by the Pittsburg, Cincinnati, Chicago & St. Louis Railway Co. as a result of damages to its property during the strike and rioting of 1894. The railway company brought suit against the city for $377,000 damages. The plaintiff took a change of venue from Cook county, and the case was tried in Dupage county, where, in a trial lasting from May 1 to August 26, 1905, a verdict for $100,000 was returned in favor of the railway.

In the Federal court at Pittsburgh, November 20, a jury returned a verdict against the Pennsylvania in a suit brought to recover a penalty for the violation of the statute requiring live stock to be unloaded for food, rest and water every 36 hours. The government showed that a car of hogs and cattle had been loaded at Decatur, Ind., September 28, and unloaded at Pittsburgh, 39 hours and 10 minutes later. The railway company claimed the delay was unavoidable and produced evidence to show that the train had been delayed by the unloading of troops at the McKinley monument exercises at Canton, Ohio. The penalty is from $100 to $500 fine.

The Michigan Railroad Commission has cited Watson Wesley, President of the Wright & Wesley Woodenware Company, of Port Huron, and Joshua Allum, a conductor on the Pere Marquette, to appear and explain an alleged violation of the Michigan railway law, which prohibits any passenger from riding on a train without paying the legal fare or any conductor from letting any passenger do so. The penalty prescribed for violation of this provision is a fine of $100 to $500 for both passenger and conductor. A railway "spotter" detected Allum letting Wesley ride free past the station to which he had paid fare and reported the case. It is claimed the company also got a letter from Wesley admitting that he made no effort to pay the conductor for the portion of this trip after he had passed the station to which he had paid.

San Francisco papers quote E. E. Calvin, Vice-President and General Manager of the Southern Pacific, as stating that this road will electrify all its lines about the bay of San Francisco. The Southern Pacific, Mr. Calvin stated, has not bought and has no interest in the Great Western Power Company or any other power company. It will go on with the building of its own great power plant on the Oakland estuary. A large part of the machinery for this plant is on the way from the East. At the present price of power in San Francisco the company can better afford to furnish its own power than to buy, as it owns oil fields from which it can get cheap fuel. The use of electricity over the Sierra Nevadas, Mr. Calvin said, is something far in the future. The company had found the motor car best for interurban transportation where traffic was comparatively light. Trolleys will be used on the Alameda and Berkeley locals and electric locomotives, power for which will be transmitted by a third rail, will be used to haul through trains in and out of San Francisco.

Rest for the Zapadores.

A special train over the Interoceanic Railway to-day took 750 zapadores from Vera Cruz to Jalapa, where the battalion will go into camp to recuperate from the effects of the hard fight that has been made on the great oil fire at Dos Bocas, in the state of Veracruz. The men go to Jalapa on account of the good climate. The men are very much worn from the effects of their work.—*Mexican Herald.*

1909 M. M. and M. C. B. Conventions.

At a meeting of the Executive Committees of the American Railway Master Mechanics', Master Car Builders' and Railway Supply Manufacturers' Associations in New York City, November 20, 1908, it was decided to hold next year's conventions at Atlantic City, N. J. The meeting of the American Railway Master Mechanics' Association will begin June 16 and last three days and the Master Car Builders' Association will meet June 21-23, inclusive. The headquarters of all three associations will be at the Marlborough-Blenheim. The rates to be charged by the different hotels at Atlantic City will be the same as last year.

The exhibits will be made on Young's million dollar pier. From the experiences of the conventions of these associations in June and of the convention of the American Street and Interurban Railway and affiliated associations in October last, the Railway Supply Manufacturers' Association was enabled to make a contract which will afford an even better layout than the plan followed in June. With the exception of Marine Hall, the exhibits will occupy the same buildings; but the main floor of the entrance building will present a very much more attractive appearance than in June last. Instead of two side entrances, members and guests of the conventions will enter through a wide doorway in the center of the building, with registration booths located conveniently, immediately to the left of the entrance. The charge for building and using the exhibit booths will be on the same basis as in June, 1908 (40 cents a square foot), including matting, signs, telephone service and power. The cost for carting exhibits to and from the pier will be the same as in June, excepting that the prices for moving heavy exhibits have been increased by 50 cents a ton; but all of the prices will provide for removing from and returning to the booths

on the pier and storing during the convention, all boxes and crates used in shipping the exhibits.

Application for space should be made to Earl G. Smith, Secretary of the Railway Supply Manufacturers' Association, 345 Old Colony building, Chicago. While application may be made at any time, no spaces will be allotted until early in 1909. Last year all applications received up to February 15 were placed by lot that day.

At the meeting of the Executive Committee of the Railway Supply Manufacturers' Association two matters of importance to the members of that association were given special attention. The first related to distributing souvenirs. The executive committees of the two railroad associations in July last decided to ask the members of the supply men's association to stop the practice of many years' standing of giving away souvenirs. This action has been endorsed by the Executive Committee of the Railway Supply Manufacturers' Association and a circular will be issued to all members. The other nuisance on which action was taken was that of giving out advertising literature amongst the exhibits. The committee decided to make a rule prohibiting the distribution of cards, circulars, pamphlets and literature of like nature amongst the booths.

The following are the officers and members of the Executive Committee of the Railway Supply Manufacturers' Association: President, Alexander Turner, Galena Signal Oil Co., Buffalo, N. Y.; Vice-President, A. L. Whipple, Forsyth Bros. Co., 50 Church street, New York City; Treasurer, H. R. Weatherly, Scullin-Gallagher Iron & Steel Co., St. Louis, Mo.; Secretary, Earl G. Smith, 345 Old Colony building, Chicago. Executive Committee: Alexander Turner, Galena Signal Oil Co., Buffalo, N. Y.; W. H. Miner, W. H. Miner Co., Chicago, Ill.; A. L. Whipple, Forsyth Brothers Co., New York, N. Y.; Frank A. Morrison, Mason Regulator Co., Boston, Mass.; Thomas Aldcorn, Chicago Pneumatic Tool Co., New York, N. Y.; R. H. Weatherly, Scullin-Gallagher Iron & Steel Co., St. Louis, Mo.; George A. Cooper, Frost Railway Supply Co., Detroit, Mich.; Samuel G. Allen, Franklin Railway Supply Co., Franklin, Pa.; E. M. Grove, McConway & Torley Co., Pittsburgh, Pa.; S. P. Bush, Buckeye Steel Castings Co., Columbus, Ohio; L. R. Phillips, National Tube Co., Chicago, Ill.; A. C. Langston, Jenkins Bros., Atlanta, Ga. The chairmen of the different committees are: Finance, Samuel G. Allen; Exhibit, Thomas Aldcorn; Entertainment, Charles P. Storrs, General Chairman; Enrollment, W. W. Rosser, and Transportation, Harry Quest.

American Society of Mechanical Engineers.

The twenty-ninth annual meeting will be held in the Engineering Societies' building, 29 West Thirty-ninth street, New York, December 1-4.

On Tuesday, Dec. 1, will be the President's address: The Conservative Idea as applied to the American Society of Mechanical Engineers, M. L. Holman.

On Wednesday the papers will be as follows:

The Engineer and the People, Morris Llewellyn Cooke; Aeronautics, Major Geo. O. Squier, Acting Chief Signal Officer, U. S. A.; A Method of Obtaining Ratios of Specific Heat of Vapors, A. R. Dodge; The Total Heat of Saturated Steam, Dr. Harvey N. Davis; Fuel Economy Tests, C. R. Weymouth; An Automatic System for Firing Fuel Oil, C. R. Weymouth. In the evening there will be a lecture on aeronautics by Lieutenant Frank P. Lahm, Signal Corps, U. S. A.

The papers on Thursday will be: Efficiency Tests of Milling Machines and Milling Cutters, A. L. DeLeeuw; Metal Cutting Tools Without Clearance, James Hartness; Interchangeable Involute Gear Tooth Systems, Ralph E. Flanders; Durability of Gears in Electric Railway Service, Norman Litchfield; Industrial Photography, S. Ashton Hand; Articulated Compound Locomotives, C. J. Mellin; Liquid Tachometers, Amasa Trobridge; Training Workmen, H. L. Gantt; An Averaging Instrument for Polar Diagrams, Prof. W. F. Durand; Salt Manufacture, George B. Willcox; Reminiscences of a Gas Engine Designer, L. H. Nash; Possibilities of the Gasolene Turbine, Prof. F. C. Wagner.

The papers on Friday will be: Physical Properties of Carbonic Acid and the Conditions of its Economic Storage for Transportation, Prof. R. T. Stewart; The Slipping Point of Rolled Boiler Tube Joints, O. P. Hood and Prof. G. L. Christensen; Tests on Friction Clutches for Power Transmission, Prof. Richard G. Dukes.

New York Railroad Club.

At the regular meeting of the New York Railroad Club, held on November 20, the following officers were elected for the ensuing year: President, J. F. Deems (New York Central Lines); Vice-President, W. G. Besler (C. R. R. of N. J.); Second Vice-President, H. S. Hayward (Penna. R. R.); Third Vice-President, Frank Hedley (Interborough Rapid Transit); Treasurer, R. M. Dixon (Safety Car Heating & Lighting Co.); Secretary, H. D. Vought. Executive members: E. T. Campbell (Erie), three years; G. W. West (N. Y., O. & W.), two years; and G. H. Campbell (B. & O.), one year. Financial committee: B. A. Hegeman, Jr. (U. S. Metal & Mfg. Co.), three years; R. L. Thomas (B. M. Jones & Co.), two years; O. H. Cutler (Am. Brake Shoe & Foundry Co.), one year.

American Railway Engineering and Maintenance of Way Association.

J. P. Snow, Bridge Engineer of the Boston & Maine, has been elected First Vice-President, succeeding William McNab, who has become President. A. H. Rudd, Signal Engineer of the Pennsylvania and former President of the Railway Signal Association, has been appointed a Director, to fill the unexpired term of Mr. Snow.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries and dates of next or regular meetings.

Air Brake Association.—F. M. Nellis, 53 State street, Boston, Mass.; June, 1909.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May, 1909.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M. R.R., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, 962 Monadnock Building, Chicago; March 16-18, 1909.
American Railway Master Mechanics' Association.—J. W. Taylor, 390 Old Colony Building, Chicago; June 16-18, 1909.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th-street, New York; 1st & 3d Wed. in month, except July and Aug.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 West 39th street, New York; December 1 to 4, 1908.
American Street and Interurban Railway Association.—B. V. Swenson, 29 West 39th street, New York.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn street, Chicago, last Wed. in April, 1909.
Association of Railway Claim Agents.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wis. Central Ry., Chicago; June 23-25, 1909.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park place, New York; December 8, 9, 1908.
Canadian Railway Club.—Jas. Powell, Grand Trunk Ry., Montreal, Que.; first Tuesday in month, except June, July and August.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; January.
Central Railway Club.—H. D. Vought, 95 Liberty street, New York; second Friday, in January, March, May, Sept. and Nov.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909.
International Master Boiler Makers' Association.—Harry D. Vought, 62 Liberty street, New York; May, 1909.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Iowa; second Friday in month, except July and August.
Master Car Builders' Association.—J. W. Taylor, Old Colony Building, Chicago, Ill.; June 21-23, 1909.
New England Railroad Club.—G. H. Frazier, 10 Oliver street, Boston, Mass.; 2d Tues. in month, except June, July, Aug. and Sept.
New York Railroad Club.—H. D. Vought, 95 Liberty street, New York; third Friday in month, except June, July and August.
North-West Railway Club.—T. W. Flannagan, Soo Line, Minneapolis, Minn.; 1st Tues. after 2d Mon. in month, except June, July, Aug.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; fourth Friday in month, except June, July and August.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden street, Bethlehem, Pa.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; second Friday in month, except June, July and August.
Southern and Southwestern Ry. Club.—A. J. Merrill, 218 Prudential Bldg., Atlanta, Ga.; 3d Thurs. in Jan., April, Aug. and Nov.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.
Western Railway Club.—J. W. Taylor, 390 Old Colony Bldg., Chicago, Ill.; 3d Tuesday each month, except June, July and Aug.
Western Society of Engineers.—J. H. Warder, Monadnock Building, Chicago; first Wednesday, except July and August.

Traffic News.

The Texas & New Orleans announces that the "Oriole" passenger trains, between Houston and Lafayette, which were taken off about a year ago, will be re-established at once.

The Mallory and the Morgan lines, running steamships between New York city and Texas, have made a reduction of 33 per cent. in freight rates on iron and steel. The other lines will probably meet the rate.

The State Railroad Commission of Colorado is making a careful investigation of the freight tariffs of the railways of the state, and some of the roads have been notified that all tariffs must be kept open for public inspection and must be filed with the commission.

The latest westbound freight tariffs from the Atlantic coast to points on the transcontinental lines contain the following clause: "The rates named herein are subject to the absolute and unqualified right of initial carrier to determine the routing beyond its own time."

Through trains between St. Paul, Minn., and Spokane, Wash., over the Soo line, the Canadian Pacific and the Spokane International will this year be run regularly throughout the winter, traffic having increased materially over what it was in former years, when the service was discontinued at the beginning of winter.

U. S. Webb, Attorney-General of California, in his biennial report to the Governor, recommends legislation to empower the State Railroad Commission to classify freight and fix rates. The Commission, he says, should have power to fix different rates for the same commodities on different lines to meet differences in conditions.

The Attorney-General of Nebraska secured an injunction from the state supreme court on November 19 against the Union Pacific, restraining the road from issuing transportation in exchange for advertising or from entering into contracts with newspapers for such exchange. The Attorney-General alleges that contracts to exchange transportation for advertising violate the state anti-pass law, the 2-cent fare law and the prohibitions of the general railroad law of the state against discrimination.

The recommendation of a joint committee representing the Southwestern Excursion Bureau and the Western Passenger Association, that the same homeseekers' rates be made to the West, Southwest and Northwest in January and February, 1909, as will be in effect in December, 1908, has been approved by letter ballot of the roads interested. This defeats the plan to maintain in 1909 a minimum rate of 2 cents a mile in western states where there are 2-cent fare laws.

It is said that notice of an increase of 90 per cent. in express rates on shipments of merchandise exceeding 500 lbs. between eastern points and Pacific coast terminals, effective December 10, has been posted in the offices of Wells, Fargo & Co. at San Francisco. The advance is said to be intended to prevent merchants on the Pacific coast from continuing to consolidate small shipments to take advantage of the lower rates on large quantities. The present rates range from $12 per 100 lbs. in lots of 500 lbs. to $7 per 100 lbs. in lots of 20,000 lbs.

The Interstate Commerce Commission probably will have to make a ruling regarding its jurisdiction over the Chicago Junction Railway and the Union Stockyards & Transit Company. These roads are engaged in switching to the Chicago stockyards shipments of live stock delivered to them by trunk lines. As all their business is handled within the state of Illinois, and they do not participate in through rates on interstate business, they claim that they are not engaged in interstate commerce and have refused to file reports required by the Commission. The Belt Railway of Chicago has complied with the orders of the Commission, while yet denying its jurisdiction upon the same grounds as the other switching roads mentioned.

Following the order of the Interstate Commerce Commission in the North Pacific lumber cases, reducing rates, the Southern Pacific is reducing rates on all lumber, including timber, poles, shingles and finished building material in car loads from points in California, Nevada and Utah, to destinations in that part of the United States east of the Missouri river and north of Tennessee and North Carolina, and also to points in Colorado, Wyoming, Nebraska, Kansas, Arkansas and Texas; and to points in Canada. The rates will be substantially on a parity with those fixed by the Commission from Pacific points. They will provide for a reduction of from 5 to 10 cents per 100 lbs. on rough lumber, laths, and general timber from points of origin to Chicago. To points east of Chicago the general rate will be about 15 cents less.

W. C. Brown, Senior Vice-President of the New York Central Lines, and F. W. Upham, President of the Illinois Manufacturers' Association, have agreed to arrange for a conference between officers of eastern railways and five shippers to be named by Mr. Upham concerning the proposed advance of freight rates. In a talk with Mr. Upham, Mr. Brown said that the proposed advance probably would not average more than 3 per cent. and Mr. Upham, who is chairman of a committee of 15 appointed by shippers to represent them in conferences on this subject, said that if the advance were to be more than this shippers probably would not oppose it. He said that the railways had not reduced wages and their expenses had increased, and therefore they were justified in making some advances; and there was a great difference between a 3 per cent. and a 10 per cent. advance.

Judge Trieber, of the Federal court at Little Rock, Ark., on November 19, held that the Arkansas Railroad Commission had been guilty of contempt of court in issuing an order prohibiting the railroads from putting in higher freight rates than those fixed by the Commission and subsequently enjoined by the Federal court and in instructing the prosecuting attorneys of the various counties of the state to prosecute the St. Louis, Iron Mountain & Southern and the Chicago, Rock Island & Pacific for collecting charges in excess of those fixed by the Commission. Judge Trieber ordered the Commission and the Prosecuting Attorney at Little Rock to withdraw the suits that have been started against the railways or to prepare to defend themselves in proceedings which, probably, would result in a fine being imposed upon them commensurate with their offense. The action of the Railroad Commission in this matter was referred to by the *Railroad Age Gazette* of November 20, page 1411.

On November 20 Ray Campbell, Prosecuting Attorney at Little Rock, dismissed the suits which he had brought against the Iron Mountain and the Rock Island. This ended the contempt proceedings that had been started against Mr. Campbell and the state railway commission. Judge Trieber, of the Federal court, in dismissing the proceedings, said that the railways were enjoined by the orders of the Federal court in these cases from continuing the commission's rates and yet were ordered by the commission not to put in different rates; that if the commission prohibited them from charging the rates adopted by the railways without prescribing different rates, it would result that the railway companies would have to transport persons and property in Arkansas for nothing, and he thought a great many shippers in the state took the view that they ought to be required to carry freight for nothing, and in addition be responsible for damages growing out of delays and losses.

Commissioner Prouty, of the Interstate Commerce Commission, continued last week the taking of testimony in the proceeding of the shippers at Chicago and Cincinnati to get a reduction of merchandise rates to the Southeast. A number of the leading wholesale merchants of Chicago gave testimony, seeking to show that the existing rate adjustment tends to keep Chicago jobbers out of southeastern markets. J. Harry Selz, of Selz, Schwab & Co., said that Chicago's wholesale boot and shoe trade in the disputed territory should be $10,000,000 annually, but is only from $1,000,000 to $2,000,000. J. V. Farwell, of J. V. Farwell Company, said the wholesale dry goods trade of Chicago could be increased $5,000,000 by satisfactory rates to the Southeast. All the Chicago merchants who testified expressed the view that they were to a large extent shut out of the Southeast by unfair adjustment of rates. T. C. Powell, Vice-President of the Southern Railway and of the Cincinnati, New Orleans & Texas Pacific, denied that the rates had been adjusted to favor New York, and said water competi-

tion had determined the rates from the Atlantic seaboard. L. Green, Freight Traffic Manager of the Southern Railway, said that if Chicago and Cincinnati got the rates they seek their merchants would still be unable to get much more business in the South. He cited specific instances where Chicago and Cincinnati have the advantage of eastern cities in rates to points in the Southeast, whose merchants, nevertheless, buy their goods in the East. The reason was, he said, that the South had many years ago established close business relations with New York and other Atlantic seaboard cities. Southern business men had borrowed capital in New York; they had got credit from New York wholesalers, etc. For this reason they would continue to buy goods in the East even if Chicago and Cincinnati were given a substantial advantage in rates. Mr. Green said that a 16-cent reduction in rates to Chattanooga, such as was ordered by the Commission in 1894, would cost the carriers $1,200,000 a year. Commissioner Prouty remarked that it was safe to assume that no reduction would be ordered greater than that ordered by the Commission in 1894. The Chicago Association of Commerce asks a reduction of 30 cents to Chattanooga. It was contended by some of the shippers who testified that water competition did not affect the rail rates from the Atlantic seaboard to Chattanooga, but Commissioner Prouty himself showed how water competition does influence this rate. The hearing was adjourned to be resumed in New York on December 14, when shippers at Atlantic seaboard points will have a chance to be heard.

INTERSTATE COMMERCE COMMISSION.

The originating road was held liable for a mistake in routing certain shipments of wheat. The shipments might have been moved either through St. Joseph, Mo., or Omaha, Neb., to Chicago, the St. Joseph rate being 35¼ cents, and the rate through Omaha being 33¼ cents. Shipments originated on the St. Joseph & Grand Island and were delivered to the Chicago Great Western. The Chicago Great Western was not held liable for the difference between the more and less expensive rates, but the St. Joseph & Grand Island was held liable.

Exception to the Long and Short Haul Clause.

Flint & Walling Mfg. Co. v. Grand Rapids & Indiana et al. Opinion by Commissioner Prouty.

A shipment of tanks and substructures weighing 52,400 lbs., from Kendallville, Ind., to Gallatin, Tenn., was charged 46 cents per 100 lbs., made up of a rate of 16 cents from Kendallville to Louisville, Ky., and of 30 cents from Louisville to Gallatin. Gallatin lies part way between Louisville and Nashville, not far north of Nashville. The local rate between Louisville and Nashville is 15 cents, but the rate to Nashville is not of necessity a standard by which the rate to Gallatin can be measured, nor is the railroad company—in this case the Louisville & Nashville—necessarily in violation of the fourth section [the long and short haul clause] in charging a higher rate to Gallatin, the intermediate point, than is charged to Nashville, the more distant point. The higher rate to Gallatin may not be charged unless this rate itself is a reasonable one, and while the rate to Nashville is particularly low on account of competition and other factors which do not enter into the determination of the rate to Gallatin, the Gallatin rate is not unreasonable in itself. The complaint is therefore dismissed.

STATE COMMISSIONS.

The Iowa Railroad Commission in making an order requiring the Chicago, Rock Island & Pacific to build a new station in East Des Moines before March 1, 1909, held that it has full authority over railroad stations and can require old structures to be remodeled or new structures to be built as public convenience may require.

The Oklahoma Corporation Commission held recently that the law did not make it the general manager of the railways but only gave it power to subserve the general interests of the traveling or shipping public or the employees of the road. A citizen of Logan county had complained because the Missouri, Kansas & Texas refused to put in a culvert for the better drainage of his land.

Hearing in Southwestern Rate Case.

Commissioners Harlan and Lane of the Interstate Commerce Commission took testimony at San Antonio, Tex., last week in the proceedings begun by the railway commission of Texas to prevent the railways of the Southwest from collecting the advances in freight rates on interstate traffic that have been announced. One of the principal witnesses examined was R. A. Thompson, Chief Engineer of the Texas Commission. His testimony was chiefly on the physical value of the railways in Texas. On cross-examination by counsel for the railways he admitted that the valuations originally made by the railway commission were much lower than the present value of the railways' physical properties. It was pointed out that the Trinity & Brazos Valley, a relatively new line, has recently been valued by the Commission at $29,932 a mile, while older, better located and more highly developed roads, such as the Galveston, Harrisburg & San Antonio and the Houston & Texas Central, are valued at only $16,000 and $19,000 a mile, respectively. Mr. Thompson admitted that the latter valuations are entirely too low and that the average physical value of Texas roads must have increased to at least $30,000 per mile owing to the advance in the value of right of way. Asked regarding the valuation of $40,200 per mile put upon the Houston & Texas Central by the state board for purposes of taxation, he said he had nothing to do with the valuation made by the state board. He said also that he thought the valuation for purposes of rate-making, taxation and for all other purposes should be the same. It was shown that since the railway commission made its physical valuation in 1894 the railways had expended many millions of dollars for permanent improvements which had been taken from income or charged to operating expenses and that these expenditures had largely increased the value of the various properties, but that the railway commission had made no allowance for these expenditures in fixing annually the value of the properties as a basis for rate-making.

R. R. Bell, Secretary of the Texas Hardware Jobbers' Association, said that Texas jobbers did not get as good through rates as jobbers in Arkansas and Oklahoma and are being put out of business by the competition of the latter. J. J. Arthur, Rate Expert of the Texas Commission, offered tables making comparisons of advances and reductions in rates to Texas common points. According to this table, in 1891 there were reductions in 23 items and increases in 84 items; in 1894, increases 44, reductions 66; in 1903, increases 54, reductions 46. Mr. Arthur also sought to show that in the attempt to make it appear that the Texas lines were unprofitable the outside lines that controlled them gave them smaller divisions of the through rates than was fair. The testimony showed that the operating ratio of controlled lines in Texas were almost invariably higher than the operating ratios of the lines outside of the state that control them.

C. Haile, Vice-President and Traffic Manager of the Missouri, Kansas & Texas, was questioned by Commissioner Lane as to whether the advance in rates under consideration was made owing to any past reductions that had been ordered by interstate or state commissions in rates on other commodities. Mr. Haile replied that "if the Commission, in its wisdom, decides that on certain commodities we cannot earn more than a certain amount, then, I take it, being entitled under the law to a return in the handling of the property, we must make it on those articles which the Commission has not touched." Mr. Lane replied that "the theory of an increased rate based to any extent upon the fact that the Commission had reduced other rates" was "rather startling to him"—that this tended to upset the adjustment the Commission had made. The reduction by the Commission referred to was in rates on cattle from the Southwest. Mr. Haile contended an offsetting advance was necessary to enable his road to pay expenses and a reasonable profit.

REVENUES AND EXPENSES OF RAILROADS.

MONTH OF SEPTEMBER, 1908.

See also issues of November 6, 13, and 20.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Ann Arbor	301	$75,306	$45,372	$131,941	$26,796	$13,659	$3,220	$40,631	$4,113	$88,419	$43,522	$8,096	$11,369	$40,249	‡$6,978
Atlanta & Birmingham Air Line	237	56,311	20,030	80,102	10,538	4,605	873	30,434	1,414	47,864	32,238	.....	4,813	27,425	4,876
Bessemer & Lake Erie	201	634,444	37,108	676,715	67,052	107,730	6,190	160,075	6,155	347,202	329,513	.....	4,000	325,513	‡24,608
Central Vermont in United States	411	188,531	115,879	326,475	57,049	50,705	7,371	136,850	7,434	259,409	67,066	1,019	9,025	59,060	‡21,364
Charleston & Western Carolina	340	81,945	18,976	111,683	25,975	14,107	2,510	42,097	2,749	87,438	24,245	.....	4,100	20,145	14,807
Chicago, Cincinnati & Louisville	285	89,043	25,733	120,188	32,578	23,747	7,334	50,038	7,298	120,995	807*	.....	3,250	†4,057	‡8,627
Chicago, Indianapolis & Louisville	616	307,759	132,854	485,235	85,186	65,439	12,833	151,271	13,451	328,180	157,055	.....	21,500	135,555	‡35,789
Chicago, Peoria & St. Louis	255	104,754	31,829	143,219	19,352	30,901	5,882	52,707	4,665	113,507	29,712	.....	4,600	25,112	1,565
Colorado Midland	338	144,621	41,572	105,654	29,368	26,777	9,578	85,005	6,601	157,329	48,325	344*	8,400	39,581	‡10,919
Detroit & Mackinac	348	61,283	25,962	92,623	10,388	13,632	2,117	28,868	2,432	57,437	35,186	654	6,498	29,342	2,917
Detroit, Toledo & Ironton	489	131,319	19,441	158,845	27,186	35,015	2,557	58,782	4,064	127,604	31,241	145*	6,979	24,117	10,202
Eastern Ry. Co. of New Mexico	227	40,299	37,807	82,904	13,798	10,108	701	20,267	2,026	46,900	36,004	.....	3,307	32,697	18,446
Elgin, Joliet & Eastern	239	205,145	16	212,423	24,069	44,749	2,232	63,265	6,433	140,748	71,675	.....	9,500	62,175	‡11,567
Fort Smith & Western	221	26,822	18,754	48,363	15,712	13,271	1,187	17,634	2,798	50,602	2,239*	.....	6,000	8,239†	‡23,428
Fort Worth & Denver City	454	249,846	154,341	424,752	66,971	54,553	7,393	119,632	13,427	261,976	162,776	863	8,800	154,839	11,093
Georgia Southern & Florida	395	97,986	44,885	162,178	10,017	20,804	4,759	56,467	9,687	101,734	60,444	1,373	7,551	54,266	31,136
Grand Trunk Western in U. S.	336	295,383	181,024	502,634	56,529	50,593	19,505	173,342	9,072	309,041	193,593	1,059*	32,000	160,534	41,745
Green Bay & Western	225	35,813	15,785	55,835	11,505	7,572	385	14,064	1,816	35,342	20,493	.....	1,846	18,647	4,105
Gulf & Ship Island	307	114,828	29,374	151,817	33,140	25,349	1,462	51,356	7,057	118,364	33,453	.....	3,685	29,768	‡10,887
International & Great Northern	1,160	537,244	146,517	725,634	85,305	98,094	15,962	254,528	19,634	473,523	252,111	.....	23,000	229,111	144,455
Louisiana Ry. & Nav. Co.	343	63,909	10,452	79,142	22,991	12,382	3,071	34,568	4,663	77,675	1,467	.....	3,000	1,533†	17,242
Midland Valley	324	56,631	24,928	85,616	17,835	18,805	1,668	27,732	4,830	70,870	14,746	.....	8,000	6,746	‡28,670
Mobile, Jackson & Kansas City	403	79,666	24,817	111,909	18,559	15,484	1,587	41,175	8,443	85,248	26,661	.....	2,831	23,830	14,279
Nevada & California	331	56,628	22,024	87,150	18,203	10,223	697	31,223	2,345	62,691	24,459	47	7,016	17,490	‡42,194
Pittsburg, Shawmut & Northern	238	56,874	9,392	68,156	15,118	37,890	1,181	23,832	3,040	81,061	12,905*	.....	1,564	14,469†	‡12,247
Quincy, Omaha & Kansas City	262	53,609	20,742	79,838	21,581	11,853	1,520	30,356	2,697	68,007	11,831	.....	2,450	9,381	201
St. Joseph & Grand Island	319	109,630	37,976	161,437	24,215	14,006	5,004	45,241	3,649	92,115	69,322	2,182	6,772	64,732	9,017
St. Louis, Brownsville & Mexico	451	59,499	27,478	93,668	16,273	12,969	2,595	33,581	4,050	69,469	24,199	167	3,000	21,366	2,470
Santa Fe, Prescott & Phoenix	257	69,350	24,011	99,680	18,877	8,852	3,128	25,038	4,327	60,222	39,458	.....	.....	39,458	‡15,138
Texas Central	268	49,135	29,364	83,916	8,958	13,925	848	37,451	3,513	64,695	19,221	.....	2,088	17,133	‡12,466
Toledo, Peoria & Western	248	60,093	39,540	104,526	15,191	17,685	2,179	34,307	3,225	72,587	31,939	.....	4,000	27,939	401
Toledo, St. Louis & Western	451	227,408	43,753	292,271	31,911	38,905	9,250	93,901	9,531	183,498	108,773	.....	11,500	97,273	‡35,982
Trinity & Brazos Valley	422	134,838	12,593	150,227	33,312	31,110	4,342	79,099	9,818	157,681	7,454*	.....	2,000	9,454†	‡14,422
Wisconsin, Minnesota & Pacific	271	51,184	18,708	74,640	15,041	5,475	286	24,767	243	45,812	28,828	57	2,986	25,899	18,500

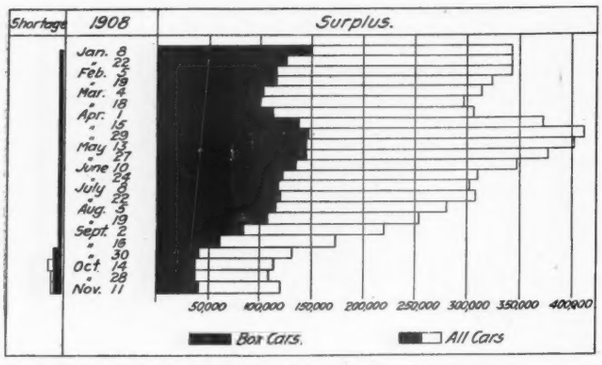
THREE MONTHS, ENDING SEPTEMBER 30, 1908.

Ann Arbor	301	$267,024	$148,277	$450,198	$67,971	$61,098	$9,629	$161,222	$12,186	$312,107	$138,091	$8,096	$34,106	$112,080	‡$40,868
Atlanta & Birmingham Air Line	237	143,487	67,031	222,370	35,338	14,537	3,028	88,217	6,835	147,955	74,415	.....	14,440	59,975	‡738
Bessemer & Lake Erie	201	1,936,247	109,700	2,062,374	173,984	306,966	16,058	484,531	19,107	1,000,646	1,061,728	.....	12,000	1,049,728	‡95,243
Central Vermont in United States	411	533,346	346,852	948,712	147,851	139,926	25,350	401,263	20,073	734,463	214,249	4,602	27,075	191,776	‡21,060
Charleston & Western Carolina	340	202,298	69,969	297,398	66,121	40,280	7,114	111,434	9,678	234,627	62,771	.....	12,300	50,471	43,374
Chicago, Cincinnati & Louisville	285	227,697	90,052	332,606	95,698	74,823	22,750	135,265	18,430	346,966	14,360*	.....	9,750	24,110†	‡47,342
Chicago, Indianapolis & Louisville	616	900,046	393,878	1,425,980	258,915	197,357	36,757	423,525	40,608	957,162	468,818	.....	64,500	404,318	‡131,915
Chicago, Peoria & St. Louis	255	281,889	99,353	399,892	57,413	97,089	17,973	150,700	13,156	336,332	63,560	.....	13,800	49,760	1,110
Colorado Midland	338	409,758	130,728	601,026	85,291	73,228	29,005	233,423	17,916	438,863	162,163	239	25,200	137,202	‡21,050
Detroit & Mackinac	348	192,650	85,203	294,465	27,702	43,002	6,284	95,261	8,274	180,523	113,942	1,350*	19,850	92,742	18,204
Detroit, Toledo & Ironton	489	355,022	47,898	426,691	67,583	95,850	7,264	162,908	15,165	348,770	77,921	335*	20,936	56,650	38,037
Eastern Ry. Co. of New Mexico	227	139,490	102,915	254,925	40,120	21,536	1,995	58,604	6,802	129,058	125,867	.....	9,922	115,945	24,722
Elgin, Joliet & Eastern	239	587,185	119	611,311	66,625	102,597	6,962	180,032	18,793	375,009	236,302	.....	28,500	207,802	‡56,428
Fort Smith & Western	221	80,801	59,493	148,924	48,858	38,599	3,097	50,672	7,620	148,846	78	.....	19,500	19,422†	‡50,602
Fort Worth & Denver City	454	708,698	484,172	1,250,673	202,592	152,476	25,968	353,756	39,033	773,825	476,848	2,821	25,933	453,736	81,330
Georgia Southern & Florida	395	242,250	153,781	448,762	27,356	69,573	15,101	167,220	26,397	305,647	143,115	4,518	22,655	124,978	55,112
Grand Trunk Western in U. S.	336	864,413	525,935	1,468,812	118,865	231,801	65,274	505,048	45,081	966,069	502,743	1,155*	96,000	405,588	98,128
Green Bay & Western	225	86,298	51,749	150,127	33,435	22,187	1,247	40,327	4,853	102,049	48,078	.....	5,538	42,540	9,944
Gulf & Ship Island	307	298,986	91,712	414,587	96,700	75,039	4,368	151,680	21,177	348,964	65,623	.....	11,055	54,568	‡100,499
International & Great Northern	1,160	1,237,824	441,298	1,808,603	277,646	297,377	44,346	729,448	58,270	1,407,087	401,516	.....	69,000	332,516	256,666
Louisiana Ry. & Nav. Co.	343	180,120	28,765	231,217	73,957	34,850	8,804	106,629	14,795	239,035	7,818*	.....	9,000	16,818†	‡6,654
Midland Valley	324	152,252	68,954	233,752	58,650	46,430	4,820	79,466	12,614	201,980	31,773	.....	20,083	11,689	‡46,546
Mobile, Jackson & Kansas City	403	221,132	75,974	320,997	57,616	43,709	4,510	113,933	25,090	244,858	76,139	.....	8,494	67,645	21,287
Nevada & California	331	149,034	66,997	241,720	44,488	32,982	2,277	87,570	6,192	173,509	68,211	188	21,051	47,348	‡154,484
Pittsburg, Shawmut & Northern	238	165,423	30,552	201,632	43,391	98,718	3,059	68,211	9,121	222,500	20,868*	.....	4,693	25,561†	‡11,832
Quincy, Omaha & Kansas City	262	133,215	59,520	208,471	52,645	31,434	4,820	88,803	8,202	185,904	22,567	.....	7,350	15,217	2,750
St. Joseph & Grand Island	319	287,593	111,521	434,766	60,971	43,285	15,632	128,822	10,885	259,595	175,171	2,657	20,316	157,512	‡31,736
St. Louis, Brownsville & Mexico	451	164,625	79,300	263,468	45,524	36,886	8,095	95,410	13,147	199,061	64,407	158	9,000	55,565	‡937
Santa Fe, Prescott & Phoenix	257	209,820	79,271	308,843	57,705	25,974	6,596	74,714	13,085	178,074	130,769	.....	.....	130,769	‡41,171
Texas Central	268	113,692	113,224	243,824	29,747	39,605	2,861	99,701	9,659	181,573	62,251	.....	6,047	56,204	‡23,231
Toledo, Peoria & Western	248	170,635	113,151	297,981	49,153	53,089	6,002	98,714	10,071	217,029	80,952	.....	12,000	68,952	21,175
Toledo, St. Louis & Western	451	693,758	151,288	907,535	100,182	131,511	28,500	283,268	27,305	570,766	336,769	.....	34,500	302,269	‡42,634
Trinity & Brazos Valley	422	270,372	39,747	318,112	85,132	67,867	11,787	186,418	27,789	378,993	60,881*	.....	6,000	66,881†	‡18,298
Wisconsin, Minnesota & Pacific	271	122,313	51,904	187,679	43,870	19,089	861	65,409	773	130,002	57,677	57	7,507	50,227	17,664

*Deficit. †Loss. ‡Decrease.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 35 giving a summary of surpluses and shortages of cars



Car Surpluses and Shortages in 1908.

by groups from October 30, 1907, to November 11, 1908, says:

"It will be noted that there is an increase of 10,262 in the number of surplus available cars. This is the first increase since the report for July 22, 1908, and it is more than offset by a further decrease of 12,875 in the number of bad order cars."

The accompanying table shows the surpluses and shortages for the period covered by the report and the diagram shows surpluses and shortages in 1908.

CAR SURPLUSES AND SHORTAGES, FROM OCTOBER 30, 1907, TO NOVEMBER 11, 1908, INCLUSIVE.

		Surpluses.					Shortages				
	Number of roads.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
November 11, 1908	160	43,274	10,516	39,848	27,536	121,174	9,291	295	1,287	786	11,659
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
November 27, 1907	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964
October 30, 1907	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,622	90,757

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago, Rock Island & Pacific will soon purchase 35 Pacific locomotives.

The Cincinnati Northern is contemplating buying five or six freight locomotives.

The Wabash-Pittsburgh Terminal Co. is asking prices on 12 consolidation locomotives.

The Colorado, Texas & Mexico, St. Louis, Mo., is asking prices on three locomotives.

The Lake Whatcom Logging Co., Bellingham, Wash., is in the market for one locomotive.

The Hocking Valley will buy 15 locomotives the latter part of next February or early in March.

The Northwestern of India is asking prices in this country for 36 switching and 15 consolidation locomotives.

The Cincinnati, Hamilton & Dayton, reported in the *Railroad Age Gazette* of November 20 as being in the market for 20 locomotives, has ordered 10 switchers from the American Locomotive Co.

CAR BUILDING.

The New Orleans Great Northern is in the market for 300 thirty-ton box cars.

The Kankakee Electric Railway, Kankakee, Ill., is asking prices on four motor cars.

The Chicago, Rock Island & Pacific will soon purchase 70 passenger train cars of various types.

The Western Construction Co., Buffalo, N. Y., has ordered eight cars from the Cincinnati Car Co.

The Northern Pacific will build 1,600 freight cars of miscellaneous types in its South Tacoma shops.

The Detroit, Flint & Saginaw has ordered four interurban cars from the Niles Car & Manufacturing Co.

The Rock Island Southern (Electric), Monmouth, Ill., is in the market for 12 motor cars and 10 trailers.

The Seaboard Air Line is said to be in the market for 500 box and 200 tank cars. This item is not confirmed.

The Chicago & North-Western ordered in October 1,000 fifty-ton steel ore cars from the American Car & Foundry Co.

The Colorado, Texas & Mexico, St. Louis, Mo., is asking prices on four combination passenger, 10 flat and 10 box cars.

The Delaware, Lackawanna & Western is said to be in the market for 500 hopper and 300 box cars. This item is not confirmed.

The Monongahela Consolidated Coal & Coke Co., Pittsburgh, Pa., has ordered 200 steel mining cars from the Youngstown Car Manufacturing Co.

The Philippine Railways, through J. G. White & Co., New York, has ordered twelve 30-ton Roger convertible ballast cars from the Roger Ballast Car Co.

The Harriman Lines have ordered 1,830 fifty-ton box cars from the American Car & Foundry Co., and are in the market for 1,500 forty-ton steel underframe refrigerator cars.

The Newburgh & South Shore, reported in the *Railroad Age Gazette* of August 7 as soon to be in the market for 275 freight cars, has not yet ordered this equipment, which includes 200 gondola, 50 side dump and 25 box cars.

The United States Steel Corporation is said to be in the market for 3,000 all steel 50-ton gondola cars. Of this number 1,200 are for the Union Railroad and 1,000 for the Duluth & Iron Range. These latter cars were reported in the *Railroad Age Gazette* of November 20. This item is not confirmed.

The Northern Pacific, reported in the *Railroad Age Gazette* of November 20 as having ordered the 63 passenger cars for which it had been in the market, has ordered this equipment from the Barney & Smith Car Co. The order consists of: 30 first-class coaches, 20 combination passenger and smoking, 10 combination baggage and express and three combination mail and express cars.

IRON AND STEEL.

The Manistee & Northeastern is in the market for about 4,000 tons of rails.

The Pennsylvania, during the present year, has purchased no rails but has been making use of about 35,000 tons which were on hand. There are still some 9,000 or 10,000 tons of these rails available, which will be sufficient until next spring. Some consideration has recently been given to orders for 1909 requirements, but nothing definite has been decided. The condition of the rails in the main track throughout the entire system east of Pittsburgh and Erie is in first-class condition. (Oct. 23, p. 1217.)

RAILROAD STRUCTURES.

CHICAGO, ILL.—The Chicago Railways Co. is taking figures on the materials for a sub-station to be built at Lill street and Sheffield avenue. It will be one story high, 46 ft. x 93 ft., and will cost $75,000. The structure will be of steel and concrete, with brick exterior.

CHIHUAHUA, MEX.—S. M. Felton, President of the Mexican Central, recently suggested that a union depot be built for all the railways running through this town, but no definite conclusion in regard to the building has as yet been reached by those interested.

GEORGETOWN, WASH.—The terms of a franchise granted to the Harriman Lines requires that work must be finished within 90 days on a viaduct 26 ft. wide to carry highway traffic over the railway tracks, from Junction street in Georgetown, to Spokane avenue in Seattle.

MOORHEAD, MINN.—The Northern Pacific has given the contract for building a new brick freight depot to Johnson, Anderson & Johnson, of Fargo, N. Dak. The structure will be 30 ft. x 60 ft.

PROVO, UTAH.—The Denver & Rio Grande will build a new union passenger station to cost about $15,000, to be used by this road and the San Pedro, Los Angeles & Salt Lake. The city council has granted a franchise for the erection of this structure.

SAN ANTONIO, TEX.—The Galveston, Harrisburg & San Antonio has given contract to a Houston, Tex., firm for building two freight depots, one to be used for outbound freight and the other for inbound. Each will be built of reinforced concrete and will be 75 ft. x 385 ft. The two buildings will cost $100,000.

SUNBURY, PA.—The Middle Creek Electric Co. expects to build a power plant at this place.

TACOMA, WASH.—The Chicago, Milwaukee & St. Paul will soon ask bids for the construction of a freight house to be built on Twenty-fifth street, just east of East D street. The buildings will have a total length of 500 ft.

SIGNALING.

The Northern Pacific is in the market for an all-electric interlocking plant, which will have 37 levers, for a yard in St. Paul.

The Chicago Great Western is to install a mechanical interlocking plant at Mason City, Ia. The material is to be furnished by the Federal Signal Co., Albany, N. Y.

The Southern Railway is to install an all-electric interlocking plant at Fair street, Atlanta, Ga., where there is a crossing with the Central of Georgia. This plant will have a 90-lever machine, made by the Union Switch & Signal Co. Plans have been made for mechanical interlocking plants on the same road at Waverly, Va.; Stokesland, Va.; Orange, Va.; Riverton, Ala.; East Florence, Ala.; Fulton, Ala., and Gainesville, Ga.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

G. A. Cooke has been appointed Assistant Treasurer of the Mobile & Ohio, a new office.

The governor of New Jersey has appointed Frank H. Sommer a Railroad Commissioner in place of Edmund Wilson, who has been made Attorney-General. Mr. Sommer has been sheriff of Essex county. He is a lecturer on law at New York University.

Operating Officers.

Joseph Avinger has been appointed Chief Train Despatcher of the Henderson division of the Louisville & Nashville, with office at Earlington, Ky.

W. E. Langley, Trainmaster of the Houston & Texas Central at Houston, Tex., has been appointed Assistant Superintendent of the Second division, with headquarters at Austin, Tex. W. F. Hall succeeds Mr. Langley.

H. G. Kruse, Trainmaster of the Eastern and Illinois division of the Iowa Central at Monmouth, Ill., has been appointed Superintendent at Oskaloosa, Iowa, succeeding C. S. Hayden, resigned. Effective December 1.

Charles B. Rodgers, Superintendent of the Chicago, Burlington & Quincy at Wymore, Neb., has been appointed General Manager of the St. Louis, Brownsville & Mexico, with office at Kingsville, Tex., succeeding J. N. Miller, resigned.

George H. Saunders, Trainmaster of the Atchison, Topeka & Santa Fe at Chillicothe, Ill., has been appointed Trainmaster at Arkansas City, Kan., succeeding W. H. Fidler, assigned to other duties. R. H. Allison, Trainmaster at Marceline, Mo., succeeds Mr. Saunders. F. E. Summers, Trainmaster at Raton, N. Mex., succeeds Mr. Allison, and E. Darling, Chief Despatcher at Raton, succeeds Mr. Summers.

Traffic Officers.

V. R. Stiles, General Passenger Agent of the El Paso & Southwestern, has resigned.

E. P. Landon has been appointed Traveling Freight Agent of the Pere Marquette at Boston, traveling in New England.

Martin Walsh has been appointed General Freight and Passenger Agent of the Memphis, Paris & Gulf, with office at Nashville, Ark.

C. H. Ogilvie has been appointed Commercial Freight Agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at Cairo, Ill.

J. T. Burns has been appointed Northwestern Passenger Agent of the Canadian Pacific, Atlantic Steamship Lines, with office at Minneapolis, Minn.

Charles N. Turner, formerly Chief of Tariff Bureau, Chicago, Milwaukee & St. Paul, has been appointed Traffic Manager of the Milwaukee Coke & Gas Co., Milwaukee, Wis.

H. C. Stevenson, Passenger Agent of the Baltimore & Ohio Southwestern at Cincinnati, Ohio, has been appointed Traveling Passenger Agent at Cincinnati, succeeding J. H. Larrabee, deceased.

H. S. Jones, Division Freight Agent of the Great Northern and the Chicago, Burlington & Quincy at Sioux City, Iowa, has resigned to engage in other business, and the position of Division Freight Agent at that point has been abolished.

The jurisdiction of C. F. Daly, Vice-President of the New York Central Lines, has been extended over all traffic, including freight, passenger, mail and express. Previously, Mr. Daly was in charge of passenger traffic only. There has been no Vice-President in charge of freight traffic since the death of Capt. G. J. Grammer in February, 1907.

H. D. Landry, Commercial Agent of the St. Louis Southwestern at Cincinnati, Ohio, has been appointed Commercial Agent at St. Louis, Mo., succeeding J. S. Houston, resigned. R. W. Byrne, Traveling Freight Agent at Cincinnati, succeeds

Mr. Landry and R. B. Campbell, Soliciting Freight Agent at Louisville, Ky., succeeds Mr. Byrne.

Engineering and Rolling Stock Officers.

W. J. Spearman has been appointed General Foreman of the Missouri Pacific and St. Louis, Iron Mountain & Southern, with office at Kansas City, Mo., succeeding A. Hewitt, assigned to other duties.

J. E. Hickey, Master Mechanic of the International of Mexico, has been appointed Superintendent of Shops of the Mexican Central at Aguascalientes, Aguas., Mex., succeeding G. F. Tilton, assigned to other duties.

T. P. Dunham, Foreman of the Holidaysburg shops of the Pennsylvania, has been transferred to Roundhouse No. 3 at Altoona. P. C. Kapp, Foreman of the State Line shops, succeeds Mr. Dunham. C. D. Barrett, Inspector on the New Jersey division, succeeds Mr. Kapp.

P. C. Staley, Foreman of the Mifflin shops of the Pennsylvania, has been transferred to the Altoona car shops. E. H. Newberry, Assistant Engine House Foreman at Derry, Pa., succeeds Mr. Staley. G. C. Schneider, Inspector at Renova shops, succeeds Mr. Newberry.

J. T. Robinson, Master Mechanic of the Seaboard Air Line at Savannah, Ga., has been appointed Master Mechanic at Jacksonville, Fla., succeeding H. P. Latta. He will have charge of all mechanical matters on the Seaboard Air Line in Florida. J. W. Sasser, General Foreman of Shops at Raleigh, N. C., succeeds Mr. Robinson.

A. B. Clark, Assistant Engineer of the West Jersey & Seashore at Camden, N. J., has been appointed Assistant Engineer of the Maryland division of the Pennsylvania at Wilmington, Del. J. C. Auten, Assistant Engineer of the Eastern & Susquehanna division, with office at Williamsport, succeeds Mr. Clark. W. T. Covert succeeds Mr. Auten.

Purchasing Officers.

W. D. Knott has been appointed Purchasing Agent of the Atlanta, Birmingham & Atlantic, with office at Atlanta, Ga. The duties of Purchasing Agent have previously been performed by Alex Bonnyman, General Manager.

Railroad Construction.

New Incorporations, Surveys, Etc.

Bayfield Transfer.—An officer writes that this company, which operates 20 miles of line from Bayfield, Wis., to West End, is projecting the line from Bayfield west to Superior, 70 miles.

California Northeastern.—An officer of this company writes that the line is under construction from Calor, Cal., to Klamath Falls, 19.74 miles.

Canadian, Liverpool & Western.—This company is being organized and will shortly apply for a charter to build a line from the Grand Trunk Pacific, near the St. Maurice river, in a northeasterly direction to the south shore of Lake St. John, thence east along the Saguenay river, with a branch line from the mouth of the Saguenay river, in a southwesterly direction along the St. Lawrence river to Quebec, thence along the western shore of the St. Lawrence river to Montreal. Smith & Johnston, Ottawa, Ont., are solicitors for this company.

Canadian Pacific.—The Saskatoon section has been extended from Asquith, Sask., to Wilkie, 75 miles.

Officers of the company have inspected the proposed route for the branch line from Panticon, B. C., to Coultee, and it is said that work will be started at once.

Chicago, Joliet & Western Interurban.—Incorporated in Illinois with $10,000 capital to build electric lines as follows: From Chicago west through the counties of Cook and Du Page; from Chicago southwest to Joliet, and from Chicago west to points in the counties of Kendall, Grundy and La Salle. The incorporators and first board of directors include E. Ford, S. A. Cross, C. Fox, F. E. Hickley and A. Rutledge, Jr., all of Chicago.

Colorado & Hereford Gulf.—An officer of this company writes that the line is under construction from Hereford, Tex., southwest to Adrian, 36 miles, by the South Western Engineering & Construction Co. This line is projected from Dalhart, Tex., southwest to San Angelo, 420 miles.

Colorado, Texas & Mexico.—An officer of this company writes that construction will be resumed on this line about January 1 and that 79 miles are graded and some of the materials on the ground. The Colorado Construction Co., Mangum, Okla., is the contractor. This line is to run from Mangum, Okla., southwest to Comfort, Tex., about 510 miles.

Columbus & Southern.—An officer of this company, which operates a line from Wyandot Junction, Ohio, southeast to South Bloomingville, 34 miles, writes that the line is under survey from South Bloomingville to Hamden Junction, 34 miles.

Delaware Tunnel Railroad Company.—Governor Stewart, of Pennsylvania, has granted charter to this company, which has a capitalization of $10,000, and proposes to build a tunnel under the Delaware river from Second and Market streets, Philadelphia, Pa., to the New Jersey line, where connection will be made with the tunnel to be built by a New Jersey corporation from the Camden, N. J., side of the river. The incorporators include W. A. Stern, President; I. H. Silverman, A. W. From and L. A. Isenthal, all of Philadelphia.

Gila Valley, Globe & Northern.—See Southern Pacific.

Harrison & Mineral Belt.—This company is being organized to build a line from Harrison, Ark., northeast to Bergman, 10 miles, it is said. The Southwest Construction Co., of Harrison, is to build the line. It is intended to ultimately extend the line south from Harrison to Clarksville, or a point on the St. Louis, Iron Mountain & Southern, a total of about 75 miles. L. D. Pride is the engineer in charge at Harrison.

Lake Superior & Ishpeming.—An officer writes that this company is now at work on the change of line through Neguanee, Mich., about three miles. (R. R. G., March 13, p. 392.)

North Coast.—Construction work on this line has been begun in Marshall Canyon and in Hangman Creek Canyon, near Waverly, Wash. The contract for two miles of heavy rock work has been let. (August 14, p. 741.)

Oregon & Washington.—See Oregon Railroad & Navigation Co.

Oregon Railroad & Navigation Co.—Press reports say that the Oregon & Washington wants bids up to noon November 30 for the construction of the Tacoma, Wash., tunnel, which is to be 8,700 ft. long and cost about $3,000,000. (Nov. 20, p. 1419.)

Southern.—The report of this company for the year ended June 30, 1908, shows that the work referred to in the previous report has been carried out. This included the double track between High Point, N. C., and Spencer, 32.1 miles, and the uncompleted portion of the double track between Knoxville, Tenn., and Morristown, on the section from Mascot and Jefferson City, 14.3 miles, all of which is now in operation.

During the year terminal improvements were made at Birmingham, Ala., Spencer, N. C., Evansville, Ind., Knoxville, Tenn., and at other places. A large new freight house was put up at Atlanta, Ga., and a new passenger station at Salisbury, N. C. New yards, additional yard tracks and improvements were made at Inman, Ga., Asheville, N. C., Canton, N. C., Louisville, Ky., and at other points; and there was under construction at the close of the year new yards and other improvements at Charlotte, N. C., Birmingham, Ala., Spencer, N. C., Decatur, Ala., Montview, Va., Hickory, N. C., and Hamburg, S. C., and a new roundhouse was built at Columbus, Miss. A number of spur tracks were also finished during the year to industrial plants and placed in operation.

Southern Pacific.—Press reports regarding extending the line of the Gila Valley, Globe & Northern, through Globe, Ariz., to Miami are premature. Surveys have been made but

no definite conclusion has been reached regarding the building of the line.

VIRGINIAN RAILWAY.—Contracts for the construction work on the Windy Gulf branch, between Mullens, W. Va., and Pemberton, about 25 miles, have been awarded to the following contractors: T. Towles & Co., Mullens, W. Va.; W. O. Lipscomb, Roanoke, Va.; J. C. Carpenter & Co., Clifton Forge, Va.; Mason & Hanger Co., Richmond, Ky.

Railroad Financial News.

BOSTON ELEVATED.—Shareholders voted on November 18 to increase the capital stock from $13,300,000 to $19,950,000. Application has been made to the Massachusetts Railroad Commission for permission to issue the $6,650,000 additional stock, the proceeds of the sale of which are to be used to pay for the original cost of the Cambridge subway and for the construction of the East Cambridge elevated and West End elevated lines.

COLORADO & SOUTHERN.—James Campbell has been elected a director, succeeding Henry Budge.

KANSAS CITY, MEXICO & ORIENT.—An issue of $785,000 first mortgage bonds secured on 65 miles of completed road from Red river south to Wichita river has been approved by the Texas Railroad Commission. The company will shortly have 432 miles of road in operation.

LOS ANGELES PACIFIC (ELECTRIC).—A press despatch states that the company has a refunding plan to take up the $12,500,000 bonds issued in March, 1906, provided the consent of 80 per cent. of the bondholders is secured. A new issue amounting to $15,000,000 is to be sold, the bonds to bear 4 per cent. interest and be guaranteed by the Southern Pacific. The company operates about 176 miles of line between Los Angeles and the Pacific ocean.

NEWTON & NORTHWESTERN.—In the Federal court at Des Moines, Iowa, Judge McPherson on November 20 ordered all property of this road sold at public auction at Boone, Iowa, to satisfy a claim for $2,500,000 by the Old Colony Trust Co. of Massachusetts, and a claim for $600,000 by the American Trust Co. of New York. The company operates a line from Newton, Iowa, to Rockwell City, 97 miles.

SOUTHERN PACIFIC.—Application has been made to list $74,866,400 additional common stock on the New York Stock Exchange. In 1904, $100,000,000 7 per cent. preferred stock convertible into common stock was authorized. There is $200,000,000 common stock authorized, of which $197,849,258 was outstanding October 31, 1908.

Supply Trade News.

The Brighton Car Co., Chicago, has bought 18 acres at St. Louis Park, a suburb of Minneapolis, Minn., upon which it will build a car manufacturing plant.

Joseph T. Markham, who has been for some time in the Sales Department of the Sellers Manufacturing Co., Chicago, has been made General Sales Agent, with office in the Western Union building, Chicago.

W. White, President of the National Boiler Washing Co., Chicago, sailed November 25 on the Lusitania for England and France in connection with business relating to boiler washing systems in England and on the continent.

The Western Railway & Contractors' Supply Co., Chicago, has been incorporated to deal in railway and contractors' supplies and general merchandise. The incorporators are James F. Dagley, John F. Brems and M. H. Powell. The capitalization is $50,000.

A report from an American consular officer in a European city says that there is an opportunity for the sale of modern coal-handling machinery in his district. Further details of this (Inquiry No. 2,787) can be obtained from the Bureau of Manufactures, Washington, D. C.

The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has received a contract from the Southern Power Co., Charlotte, N. C., for transformers aggregating 93,000 kilowatts capacity. They will be used on the transmission line between Charlotte, Greensboro and Greenville.

The American Water Softener Co., Philadelphia, recently received an order from the Seaboard Air Line for water softening plants to be installed in Florida. One of these plants, with a capacity of 10,000 gallons per hour, is for installation at the recently completed shops at West Jacksonville.

On December 1, the name of the Expanded Metal & Corrugated Bar Co., St. Louis, Mo., will be changed to the Corrugated Bar Company. On that date, also, the offices of the company will be moved to the National Bank of Commerce building. For several years past the main business of the company has been the sale of corrugated bars.

Paul J. Kalman, 805 Pioneer Press building, St. Paul, Minn., Northwestern Railroad Representative for the Detroit Seamless Steel Tubes Co., Detroit, Mich., is now handling in St. Paul and Minneapolis the full line of seamless steel tubing manufactured by this company, including stationary boiler flues and mechanical tubing for automobile construction and other purposes.

J. R. Gordon has been made Sales Manager of Power Apparatus for the Western Electric Co., Chicago, in charge of the Southern territory, with office at Atlanta, Ga. Mr. Gordon had been for many years Southern District Manager of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa. He is a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers.

Joseph Bryan died at his home near Richmond, Va., on November 20, after an illness of only a few days. Mr. Bryan was President of the Richmond Locomotive & Machine Works from 1898 to 1901, when the company was purchased by the American Locomotive Company, New York, and at the time of his death was a Director of the American Locomotive Company and Managing Director of the Richmond plant. He was also owner of the *Richmond Times Dispatch*.

P. W. Hood, formerly of the firm of Tweedy, Hood & Finley, Chicago, has associated himself with the American Distributing Co., Cleveland, Ohio. This company has recently opened a branch office in the Old Colony building, Chicago, where it will conduct an exclusively railway sales department. Mr. Hood will devote his entire time to the railway field. The American Distributing Co. now has the exclusive sale to the railway trade of Herndon's Japan oil, manufactured by the Globe Manufacturing Co., Peoria, Ill.

The Southern Car Manufacturing & Foundry Co., Beaumont, Tex., has awarded the contract to William Renfroe, of Beaumont, for improvements to its plant, including the erection of one large building and several small ones. The new building will form a part of the present structure which is to be remodeled. The completed structure will be 27 ft. x 135 ft. Another building to be erected will be 75 ft. x 91 ft., and equipped for manufacturing and assembling machinery. A fuel house is included in the plans.

The plan for the reorganization of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has been declared operative, and it is expected that the receivership will be terminated shortly. The details of this plan, which is based on the merchandise creditors' plan, have been given in these columns. It provides for the settlement of all creditors' claims by cash, stock and long-time obligations, so that the company will have, as soon as the receivership is terminated, abundant working capital and no floating debt. George Westinghouse will remain President of the company and there will be 16 directors representing bankers and others closely interested in the affairs of the company. The company went into the hands of receivers on October 22, 1907.

At a meeting on November 24, the stockholders voted to increase the authorized capital stock by $10,000,000. Of the $10,000,000 additional stock, only between $2,000,000 and $3,000,000 is needed under the readjustment plan. The balance will be subject to issue by authority of

the board of directors. The meeting was adjourned until November 30, when the following propositions will be acted upon: First, to increase the number of and classification of the board of directors; second, to adopt new by-laws or to amend the present ones to carry into effect the provisions of the merchandise creditors' plans for the readjustment of the debt of the company; third, to elect a board of directors; fourth, to elect a proxy committee. The readjustment committee, the merchandise creditors committee and the stockholders committee approved the following board of directors: Edwin F. Atkins, Boston; A. G. Becker, Chicago; Anthony N. Brady, New York; Charles F. Brooker, Ansonia, Conn.; J. D. Callery, Pittsburgh; E. C. Converse, New York; Richard Delafield, New York; E. M. Herr, Pittsburgh; James S. Kuhn, Pittsburgh; Joseph W. Marsh, Pittsburgh; William McConway, Pittsburgh; Charles A. Moore, New York; Neal Rantoul, Boston; George M. Verity, Middletown, Ohio; George Westinghouse, Albert H. Wiggin, New York. The committees also approved of the following proxy committee: Charles Francis Adams, Boston; James N. Jarvie, of New York; F. W. Roebling, of John A. Roebling's Sons Co., Trenton, N. J.; Jacob H. Schiff, of Kuhn, Loeb & Co., New York, and Robert S. Smith, President Union National Bank, Pittsburgh.

TRADE PUBLICATIONS.

Pointers on Power.—A small catalogue just issued by the Western Electric Co., New York, discusses the subject of machine drive by induction motors, showing illustrations of Western Electric induction motors attached to various types of machines.

Turret Lathes.—The Pratt & Whitney Co., Hartford, Conn., has just issued a 3⅛-in. x 4⅛-in. catalogue, illustrating and describing a number of turret lathes. There are several half-tones made from photographs of groups of work made on this machine, including bar and chuck work.

Metallic Packing, Bell Ringer, etc.—The Ward-Packer Supply Co., Chicago, has just issued a catalogue of railroad supplies, covering metallic packing for locomotive piston rods and valve stems; vacuum car cleaning machines; Ames water glass shield; bell ringers and Minnesota boiler compounds. A number of half-tone illustrations are included.

Track Supplies.—The Railroad Supply Co., Chicago, has issued for the use of trackmen a vest pocket size catalogue containing illustrations and descriptions of various kinds of tie plates and their application, track tools, nut locks, track bolts, Stanford patent bumping post, switch stands, etc. Several pages are devoted to tables giving instruction for track laying and maintenance.

Grab Buckets.—The Brown Hoisting Machinery Co., Cleveland, Ohio, has just issued a catalogue containing illustrations, both half-tone and line cuts, of "Brownhoist" grab buckets and tubs. These grab buckets are made for handling coal, ore, limestone, etc. Single and double-rope buckets are included, along with several illustrations of coaling plants where this machinery is in use.

Heisler Geared Locomotives.—Catalogue No. 108, issued by the Heisler Locomotive Works, Erie, Pa., gives an illustrated detailed description of the construction of the patented Heisler geared locomotive. A large number of drawings show the various parts of this type of locomotive. A list of 70 names, which is a partial list of the users of the Heisler geared locomotives, includes steam railroad, logging and industrial companies.

Cloth for Car Roofing.

Wilford waterproof cloth, used by railways for car roof covering, locomotive curtains, etc., is made of twisted flax thread, a cloth which is strong, light and durable and will not crack. It is said to be impenetrable by water, either salt or fresh, and that its softness, lightness, strength and durability make it a superior grade. In applying the material to car roofs, it is placed on the freshly painted boards, to which it adheres much the same as if it were glued. Several coats of paint are then applied over the cloth. This cloth is also used as covers for lighters by railways having floating equipment. E. A. Bunker, P. O. Box 1579, New York City, is the sole agent for this cloth in the United States and Canada.

The New Telephone Exchange for Paris.

On September 20 the central telephone exchange of Paris was completely destroyed by fire. The backbone of the city's organization was broken and, although it was Sunday evening, a period when telephone service is unusually light, its loss was keenly felt throughout the city. In addition to the total interruption of telephone service throughout the city and between Paris and the provinces, all long-distance service was cut off. To make matters worse, many of the long-distance telegraph lines, which had been strung under the telephone exchange, were destroyed by the flames. This seriously affected telegraphic communication with England, Belgium, northern France and the suburbs.

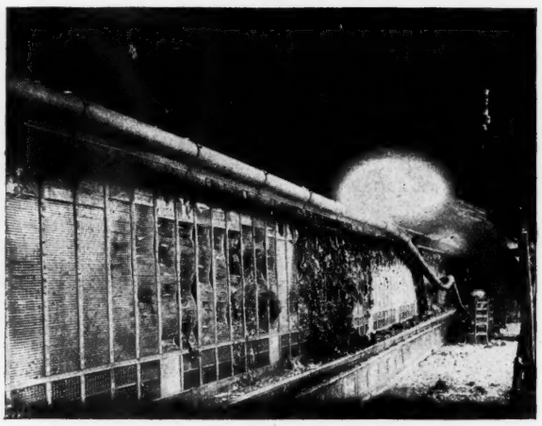
The department of telephones succeeded in restoring communication

Burned 9,000 Line Board.

with London and Brussels within 24 hours and Berlin was connected in about 48. A provisional exchange was set up in the Bourse de Commerce and the telephone department made every effort to hasten the erection of the apparatus it had.

Although some long distance lines were re-established within 24 hours, the problem of restoring local service assumed gigantic proportions. When a similar condition of affairs had occurred in Rio Janeiro, Brazil, the Western Electric Co., Chicago, had in 10 days after the receipt of the cablegram asking for an emergency outfit shipped an emergency switchboard of 5,000 lines.

Negotiations were begun with the Paris office of the Western Electric Co. and on September 21 the New York house cabled that they could ship at once a 9,600 line emergency equipment and gave an approximate price. On that day the New York house also wired the Chicago house, where the main manufacturing plant is located, asking how soon they could build a 10,000 line standard equipment, and on the same day New York cabled Paris that, in addition to the emer-



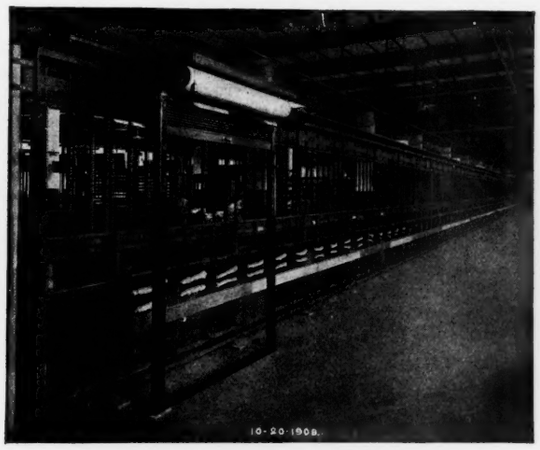
Burned 10,000 Line Board.

gency equipment, they could ship a 10,000 line board in two months.

It was, however, decided not to buy the emergency equipment, but instead to have shipped by steamer from New York on October 7 50,000 ft. of No. 64 conductor, 5,000 ft. of No. 53 conductor, 50,000 ft. of No. 43 conductor and 30,000 ft. of No. 21 conductor switchboard cable. It took eight men from 7 p. m. until 2.30 a. m. the next morning to pack this cable ready for shipment. It was ready complete two days after the order was received and hurried to New York, where, on October 5, it was rushed aboard the French steamer which sailed October 7, arriving in Havre October 14. The quick delivery of this cable

was probably instrumental in bringing about the large switchboard order which followed.

From September 28 until October 7 a series of cablegrams were exchanged between New York and Paris. Paris would order one day, change the order the next and so on, and it was not until October 7 that the New York house actually had the necessary information to give the manufacturing plant at Chicago to enable them to have a good understanding of the requirements. The Paris house had contracted to furnish a 10,000 line equipment complete in two months. Furthermore, each day's delay would cost the company a penalty of $600. Both cablegrams and letters urged the factory to make all possible speed and to furnish the board in thirty days, if possible.



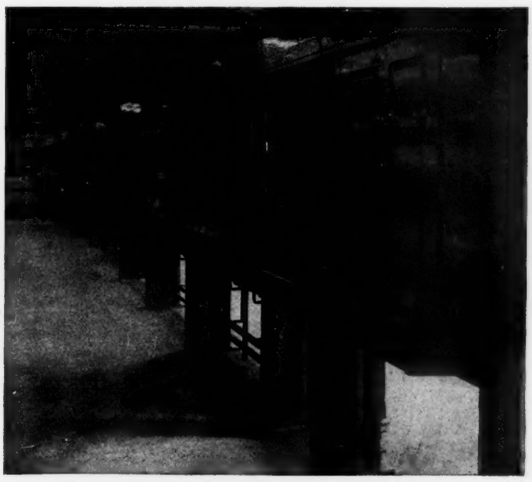
Rear View of Framework of New Board, Just Before Shipment.

This would allow the Paris house more leeway for the installation of the board upon its arrival in Paris.

On October 9 word was received at the factory that the cable and relay racks must be shipped at once, so that the Paris house could commence installing them.

To prevent any hold-up in shipment, arrangements were made with the railways in advance insuring prompt service, the number and sizes of the boxes to make the shipment was estimated and space reserved on the French steamer sailing October 29. The racks were completed on October 16, just six days being taken for the manufacture. They were rushed through to New York and left for Paris October 22.

Meanwhile the work of building the huge switchboard was being



Front View of Section of New Board.

pushed to completion. On October 23 the finished board, over 180 ft. in length, was ready for shipment. The factory cabling was started on October 8 with 24 men soldering 3,000 jacks per day. This force was gradually increased, the overtime running until a late hour each night, until at last when the job was nearing completion there were 65 men soldering 25,500 jacks per day. The total work was about a million soldered connections. The cabling on this job was nearly 16,000,000 ft. of single conductor, or about 3,000 miles.

The entire board was completed in 23 days and on September 27 the entire equipment was in New York ready to load on the steamer. The shipment consisted of six carloads of material, in addition to the cable, and the telephone apparatus made in the New York plant of the company. Instead of taking 30 days to complete a switchboard which ordinarily would have taken 60 days to build, the company had completed it in 23 days.

The shipping of this switchboard was greatly facilitated through the co-operation of the Grand Trunk and the Delaware, Lackawanna & Western. Together they made all the necessary arrangements, so that when the 234 boxes containing the switchboard were received at the Hoboken terminal of the Lackawanna, only about two days had elapsed since they were loaded upon the cars at the Hawthorne works of the Western Electric Company.

Hauk Portable Oil Burners.

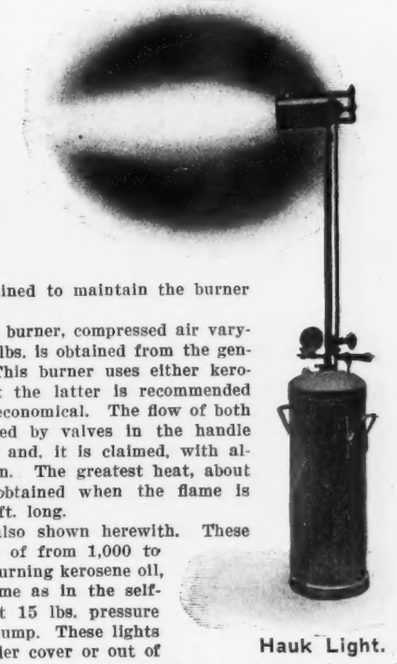
The Hauk Manufacturing Company, Brooklyn, N. Y., is at present making two styles of portable oil burners, designed for heating metals in the various manufacturing industries. Especially are the burners useful in railway shops for repairing steel cars or locomotives, for use in boiler-shop rivet forges, brazing, annealing, etc. Locomotive frames may be welded or straightened without being moved from their position, blistered crown sheets easily and quickly repaired, and alterations made in piping alinements, etc. The feature of efficiency is that in many cases it is more desirable to make a locomotive repair or alteration by the use of the portable burner than to strip the locomotive in order that the part may be taken to a forge. Of the two styles of burners, one is a self-contained plant using kerosene oil. This burner is for use where compressed air is not available. The illustration herewith shows a tank, the capacity of which varies in different sizes from 10 to 15 gals. After filling with the oil, 15 lbs. air pressure is obtained with a pump, the handle of which is seen in the illustration. Sufficient air is thus obtained to maintain the burner in use for 10 hours.

Hauk Portable Oil Burner.

Self-contained plant, using kerosene oil.

In the other style of burner, compressed air varying from 5 lbs. to 100 lbs. is obtained from the general shop reservoir. This burner uses either kerosene or crude oil, but the latter is recommended since it is much more economical. The flow of both oil and air is regulated by valves in the handle giving absolute control and, it is claimed, with almost perfect combustion. The greatest heat, about 3,000 deg. Fahr., is obtained when the flame is regulated to about 2.5 ft. long.

The Hauk light is also shown herewith. These are made to give light of from 1,000 to 5,000 candle-power. Burning kerosene oil, the principle is the same as in the self-contained burner, about 15 lbs. pressure being obtained with a pump. These lights may be used either under cover or out of doors and are largely used in night operations in construction work, gravel pits, tunneling, shops, foundries, etc.



Hauk Light.

Important Electric Heater Decision.

James F. McElroy vs. Edward E. Gold; Interference No. 28,316, in United States Patent Office, for Electric Heaters.

This interference, relating to electric heaters having junction boxes, between an application of James F. McElroy and the patent to Edward E. Gold (President, Gold Car Heating & Lighting Co., New York), No. 850,924, and dated April 23, 1907, has been decided by the Patent Office in favor of Edward E. Gold, by reason of an abandonment by McElroy

of his claim of priority. The official notice of the decision issued by the Commissioner of Patents reads as follows:

"On November 11, 1908, James F. McElroy filed an abandonment of the invention involved in this interference. Priority of invention of the subject matter in issue therefore awarded to Edward E. Gold."

The subject matter in issue includes four claims of said Gold patent covering a form of electric heater heretofore manufactured by the Consolidated Car Heating Co., Albany, N. Y., namely:

1. An electric car heater having a resistance medium interposed between a pair of opposite heads through at least one of which a conducting wire passes and between which said medium is exposed to the air to heat it, and having a chamber outside of the head through which such wire passes, said chamber constituting a junction box for enclosing the connection of such wire with the line wire leading to the heater.

2. An electric car heater having a resistance medium interposed between a pair of opposite heads through at least one of which a conducting wire passes and between which said medium is exposed to the air to heat it, in combination with a separate casing forming a chamber outside of the head through which such wire passes, said chamber constituting a junction box for enclosing the connection of such wire with the line wire leading to the heater.

3. An electric car heater having a chamber constituting a junction box for enclosing the ends of the line wires leading into the heater, said junction box having a socket for receiving the end of a conduit enclosing the line wire outside of the heater.

4. The combination with an electric car heater, of a line wire and a conduit enclosing the same, and a junction box receiving the end of said conduit and providing a space between said conduit and the heater and enclosing the junction between the line wire and the end of the heater wire.

The Groff Track Drill.

The cut herewith shows a Groff track drill in position for drilling through the web of a rail. This drill may also be used in a vertical position for drilling through the base. The locking lever in this latter case grips the rail on the underside of the head, rather than as seen in the illustration. This device may also be used as a hand-drill press, an angle iron similar to the locking lever being substituted for it. It is claimed that a 5-lb. pull on the handle exerts a pressure of 2½ lbs. on the drill. Although the drill is advanced during both motions of the lever, the same power is not required for both strokes: for instance, a ¾-in. drill in block signal rail bonding requires a pull of 5 lbs. in one direction and about 1 lb. pressure in the opposite direction. The operator therefore is not wearied, as would be the case if the same pressure was required for both strokes. A friction feed may be set which will advance the drill at any required rate. This feed may be quickly adjusted, which is especially valuable in drilling rails, as the thickness of the chip may be varied according to changing degrees of hardness in the metal. This guards against the drill's taking an excessive cut in the soft spots and also prevents it from jamming when pointing to go through the metal, the pressure being relieved as the metal becomes thin. The feed is set to take a thin chip in normally hard metal. This insures the greatest available speed at all times owing to the automatic feed. The machine for block signal rail bonding work weighs about 15 lbs. while the machine for drilling rails for angle bars, bolts, etc., weighs about 18½ lbs.

15-lb. Groff Track Drill.

These machines are filled with grease and it is said will run one year, under ordinary usage, without additional lubrication. The feed screw being protected, the machine may be exposed to all sorts of weather, rough usage about the track, etc., without harming it. The moving parts are made of vanadium steel. The casing of the machine is of a high grade crucible cast steel. The method of fastening these machines to the rail permits their being attached or removed almost instantly, regardless of whether the machine is drilling or not. As seen in the illustration, the machine is locked with a cam, which by blow of the hammer falls to a horizontal position, and permits the machine to be withdrawn from the rail. The drill is adjusted by a small crank on the outer end of the casing. This movement is independent of the friction feed, as the crank is held stationary by a pin. The automatic friction feed is always ready for work. These machines are made by the Groff Drill & Machine Tool Co., Camden, N. J.

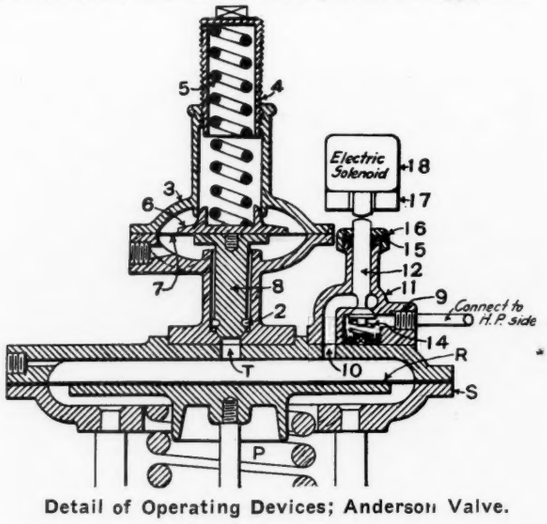
Testimonial to R. T. Walbank.

At a meeting of the Railway Supply Manufacturers' Association at Atlantic City, in June last, Daniel M. Brady suggested that the work of the President of the association should be recognized, on his retirement, by presenting to him a gold badge. While his suggestion was lost sight of at the time because of the discussion of another subject then before the meeting, the executive committee subsequently took the following action: A committee, consisting of W. H. Miner (W. H. Miner Co., Chicago); George A. Cooper (Frost Railway Supply Co., Detroit, Mich.), and A. L. Whipple (Forsyth Bros. Co., New York City) was appointed with instructions to select a design that could be used as a pattern in future years and to have one badge made and presented to the retiring President, R. T. Walbank. The badge, a photograph of which is herewith reproduced, was given to Mr. Walbank at a meeting of the executive committee of the association at the Hotel Belmont, New York City, November 20, 1908.

Anderson Controlling Altitude Valve.

The Anderson controlling altitude valve was described in the *Railroad Gazette* of February 14, 1908. The accompanying cut shows new improvements which have been added to it. The part illustrated shows simply the two devices for controlling the movement of the vertical spindle, below diaphragm R, which operates the lower valves and by-passes, which control the movement of the main inlet valve. This latter operation was described and illustrated in these columns in the article referred to above.

The improvements consist, first, of the apparatus for closing the valve in case of fire pressure from pumps, or other causes preventing the overflow of the standpipe, tank or reservoir, which is the usual automatic means of closing the valve. Connection is made, at the port shown at the left, with the main pressure or supply line. The valve is adjusted for this service by screwing down the sleeve 4, compressing the spring 5. The pressure under diaphragm 7 raises the valve 8 from its seat, permitting the water to flow down on top of the diaphragm R. This lowers the vertical spindle and closes the main valve in the usual way.



Detail of Operating Devices; Anderson Valve.

The other new way of closing the valve is through the operation of the electric solenoid, shown at the right. This is wired to the pumping station and can, of course, be operated from any other desired point. When the circuit is closed the solenoid draws down the valve spindle 12, opening the valve 14, and allowing water from the pipe connected with the high-pressure side, as indicated, to flow through the port 10 to the top of the diaphragm R.

This valve is made by the Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.